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ELECTRIC RAILWAY JOURNAL

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Westinghouse

Electric Railway Journal

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In This Issue

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Executives Attend U. S. Chamber

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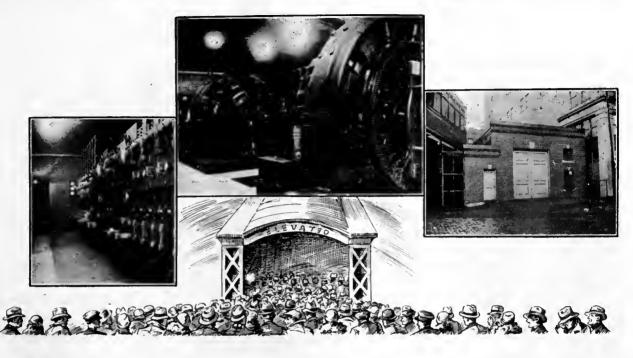








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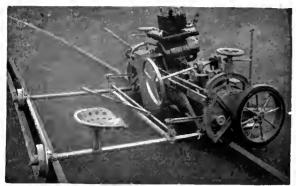


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EAST PITTSBURGH PENNSYLVANIA

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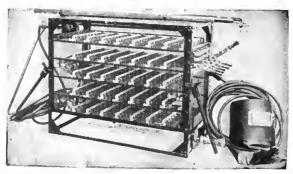
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Eureka Radial Rail Grinder



Imperial Track Grinder



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The staggering price of backward-ness"

That's what this paper called the high cost of doing nothing toward replacement of obsolete equipment— discussed by Mr. E. P. Waller, General Electric Company. Said he:

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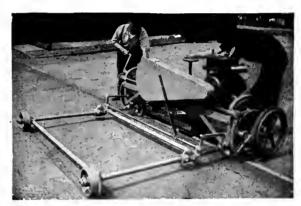
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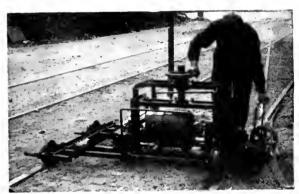
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Bond Performance is mportant to 182 New Jersey Cities and Towns

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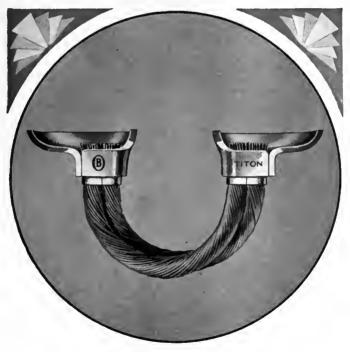
To render efficient service to such a

great group is a problem of considerable magnitude. Schedules must be maintained. Peak loads in a dozen metropolitan cities must be provided for each day. Unavoidable delays must be minimized.

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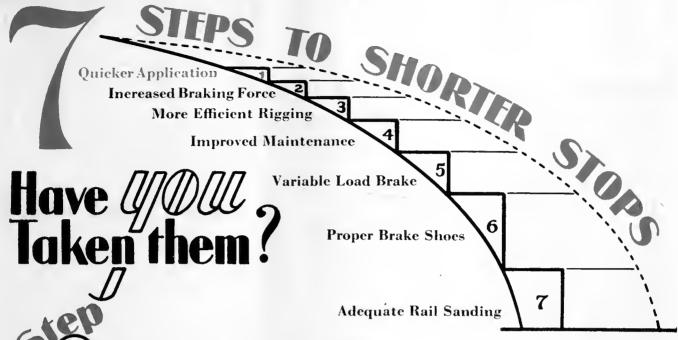
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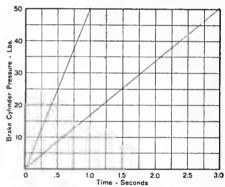
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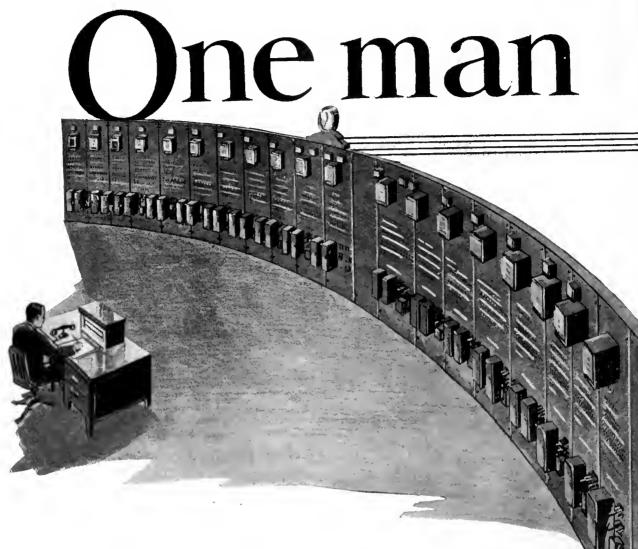
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supervises this system







The Colerain substation in Cincinnati (above), one of 19 attractive buildings which house a selector panel (left). This panel, connected by four wires to a control panel in the dispatcher's office, selects the equipment to be controlled (right) and then transmits the impulse which completes the desired operation.

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Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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CHARLES GORDON, Editor

Louis F. Stoll.

Volume 73

New York, June, 1929

Number 15

Community Transportation an Unrecognized Major Element in Prosperity

HAVING local transportation service conveniently available has come to be accepted as a matter of course by the American public. Memory fails to recall the time when such facilities did not exist. Before the advent of electric cars our fathers had cable cars, and before that, horse cars. In those early days the development of transportation facilities was of interest, but nowadays it receives scant attention. This waning appreciation of the economic importance of public transportation is due in part to long familiarity, and in part to the greatly increased interest in private transportation. Where one person formerly owned a horse and carriage, hundreds now own automobiles. The private automobile has become the pleasure vehicle for the masses, while the street car has been relegated to the rôle of a mere utility and has lost prestige accordingly. Despite its loss of social standing, however, the public transportation vehicle today remains a vital factor in the social and business life of every large community.

That the American public has become "automotive minded" is so clearly apparent that there is little need for calling attention to the fact. This is true not only of the so-called masses, but of intelligent business men and economists

From the point of view of the local transportation industry, "automobile mindedness" in this country has produced a peculiar and highly critical situation. The nation has apparently forgotten that it has such a thing as a local transportation industry in which there is invested \$6,000,000,000 of money and which has been very sick for more than a decade. It has overlooked, as well, the fact that this industry has played a vital part—and continues to do so—in the upbuilding of American communities and American industrial life as we know it today.

Business men and economists are keenly interested in the factors that have contributed to the country's prosperity during the past seven or eight years, and are eager to eliminate any conditions that may be harmful to the continuation of that prosperity. The difficulties of the farm industry, railroads, shipping, oil, textiles, and in a somewhat smaller degree, coal and lumber, elicit the interest and concern not only of business men and economists, but of the general public itself. The front pages of the newspapers of the nation have gone "economic." They reflect the popular interest in the continuation of present prosperity. The country has put an economist in the White House. The houses of Congress and the departments of the government are occupied with economic questions. National business organizations are concentrating on the economic inter-relations of business.

But in all of this interest and activity the public seems to have lost sight of the size, importance and difficulties of the local transportation industry which is bound up vitally with industrial, economic and even social well being and progress of the nation.

Fifth Avenue's Beautiful Dream Is Shattered

 ${f F}^{
m OR}$ years the merchants of the aristocratic Fifth Avenue-shopping district in New York City have talked grandiloquently about the tremendous number of customers who come rolling up to their stores in limousines. Spokesmen for the Fifth Avenue Association have rushed into print to oppose parking restrictions with vociferous statements concerning the evils of such meas-Their labored arguments, however, do not always stand up under the light of unbiased investigation. For example, a statement published a short time ago in the New York newspapers and credited to W. J. Pedrick, executive vice-president of that association, branded the Chicago parking restriction as a failure and declared it had worked great harm to downtown business in the Illinois metropolis. Subsequent investigation disclosed the facts to be the reverse and furthermore failed to show that Mr. Pedrick had talked with any of those who could have informed him authoritatively as to the actual results of the Chicago experiment. More recent statements from the same sources, purporting to be based on the result of parking "studies" covering a two year period, claimed that the private automobile was furnishing 51 per cent of the daily business of the Fifth Avenue stores.

Now for the first time an actual customer count has been made under the auspices of the Citizens' Street Traffic Committee at some 50 stores, and the merchants have learned to their astonishment that less than 4 per cent of their customers come by private automobile, while more than 96 per cent come by public conveyance, or walk to the stores. Thus, as regards transportation, the Fifth Avenue district turns out to be no different from Chicago, Philadelphia, Detroit, Los Angeles, and every other large city where a vast majority of the traveling public are users of public conveyances.

To what extent the figures disclosed by this survey will influence the Fifth Avenue merchants to recede from their position regarding the restrictions of the parking privilege, is impossible to forecast. It is proverbial that "none are so blind as those who will not see." Growing congestion is making the Fifth Avenue district more difficult of access every day. Unless the situation is remedied people will do their shopping in other districts more easily accessible. Yet the practice continues of using the public streets for the storage of private automobiles to the detriment of all moving traffic. In their own interest,

the Fifth Avenue merchants should rouse themselves from their dreams of "carriage trade" and face the facts concerning parking the same as they would face any other facts connected with the conduct of their business.

A Contribution to the Struggle for Clearer Economic Insight

ON THE 15th of May there was made public for the first time the report of the committee on recent economic changes, of which Herbert Hoover was chairman, and which was based upon an economic survey of the period from 1922 to 1929 compiled by the National Bureau of Economic Research. Though quite brief and easily read, the report condenses into a few pages a résumé of economic philosophy based upon the study of current facts, which merits the careful attention of every industry and every good citizen of the country. The report and survey were recently published in book form by the McGraw-Hill Book Company under the title "Recent Economic Changes."

To a broader understanding of economic forces, more general co-operation within industry itself, and an enlarged measure of self-restraint on the part of all elements of the business, financial and industrial world, the committee attributes the fact that the period from 1922 to the beginning of 1929 was one of unusual stability and business activity. During this period the country has been successful in maintaining a condition of economic balance between the forces of distribution and consumption despite a period of rapid acceleration in activity, "spotty" penetration of prosperity as among industries and geographical districts, and unusual conditions arising out of peace-time adjustments.

One of the striking and significant developments of the period under study, according to the committee, is in the field of price relationships, wages and the cost of living. Between 1896 and 1913, the price level rose 2.3 per cent a year while the purchasing power of wages rose only 0.5 per cent a year, whereas during the period between 1922 and 1927 price levels declined 0.1 per cent a year while wages rose 2.1 per cent a year. The committee attributes to this combination of a steady rise in wage levels with a stationary cost of living, a widespread influence on the whole economic situation during the period of its study. It points out, also, that this high wage level was combined with low unit production costs, through increased productivity of labor by introduction of labor-saving machinery. No other period in our history has shown so striking an increase in productivity per man-hour. Per capita productivity was nearly 60 per cent greater than in the late 90's, and in manufacturing increased 35 per cent from 1922 to 1925.

Above all else the committee stresses the importance of maintaining an economic balance between the various factors and forces in our complex economic structure. All parts of the structure are interdependent and easily affected. Ignorance of economic principles, greed, inadequate or incompetent leadership, waste of natural resources, use of credit for speculation instead of productive purposes, or artificial unbalancing of prices as between industries, can quickly throw the entire complicated economic machine out of synchronism. Although the committee is unable to go further than this in pointing out specific measures for insuring the continued, smooth and accelerated flow of production, distribution and consumption, it holds that complete control

of the economic system is a possibility to which we may look forward through increasing knowledge and skill, by following a course of continued research, study and orderly classification of facts. As to the causes of the successful combination of conditions through which we are passing, and which were the basis of the committee's report, it is apparent that they were partly accidental and partly the result of forward-looking industrial and economic thought and intelligent leadership.

Supreme Court Makes Railroad History

DURING the long struggle to determine the basis of "fair value," which has been the great bone of contention from the very beginning of commission regulation of railroads and public utilities, probably no more momentous decision has ever been made by the courts than that rendered on May 20 by the Supreme Court of the United States in the St. Louis and O'Fallon Railroad case. Certainly no more sweeping a victory has ever been won by a railroad in which so much was at stake, for it involved the principles upon which the Interstate Commerce Commission is to evaluate for rate making purposes and for the control of earnings, from \$15,000,000,000 to \$20,000,000,000 of railroad property in the United States.

The case arose under that provision of the transportation act of 1920, which requires a railroad to turn over to the government one-half of its net income in any year which exceeds 6 per cent of the value of its property. In fixing the value of railroads for rate making and for the application of this provision of the transportation act, the commission started with the cost of reproduction as of June, 1914. This figure was brought down to 1919 by adding or subtracting all additions and betterments subsequent to 1914, less depreciation, but making no adjustments for changing construction cost levels between 1914 and 1919 on the property valued as of 1914. Since 1920, the railroads had been required to submit to the commission data which permitted these figures to be brought down to date in any year.

Counsel for the O'Fallon Railroad insisted that the commission did not determine the actual value of the railroad by considering all relevant facts and circumstances, and with the exception of valuing the lands, had based its valuation on the prudent investment theory. The central point of the Supreme Court's decision is that it held that the Interstate Commerce Commission must take into consideration as one of the factors in value, cost of reproduction; and that it had failed to do so in the method which it had followed.

Thus it is apparent that cost of reproduction becomes a factor of increased importance in the determination of value for rate-making purposes. This does not mean, of course, that reproduction cost at current price levels is the sole basis of valuation. It has been repeatedly pointed out by economists that such a theory is as unsound as is that of original cost, for it would introduce a speculative element into value that would have as disastrous an effect upon utilities during a period of falling prices as it would be advantageous when prices are rising. But the Supreme Court has said in this case that reproduction cost is one factor, that with others must be considered. Obviously the day when valuation for rate-making purposes can be reduced to a formula is still a considerable way off.

No Cars Available?

ANTICIPATING an extensive car improvement program, the Louisville Railway has purchased three sample cars from three different car manufacturers. Of course, no outstanding interest can be attached to a mere order for new equipment, but the conditions surrounding the Louisville purchase and the method of ordering the sample cars raise this order above the level of the ordinary. At the present time the railway is in the throes of securing a fare adjustment. Negotiations are under way to determine a rate which will yield a reasonable return on the fair value of the property. But along with its request for higher rates, the railway plans to offer the public a maximum of service compatible with its earnings.

With this objective in view, the railway requested the manufacturers to build that type of car, seating approximately 50 persons, which in their estimation would best meet the present-day street railway needs. All other details were left to the manufacturers, so that each might produce the car which in his estimation was the vehicle having the greatest merchandising

attractiveness.

As was to be expected, no cars were available! The manufacturers have not in the past followed the practice of building standard models to deliver when an order is received. But this raises the old question: "Could the manufacturers dispose of standard models successfully, just as the bus manufacturers do?" It is still a matter of conjecture, and one that can be decided only by overcoming the inertia of following old practice adhered to by both railways and manufacturers. Certainly the manufacturers would welcome any move to bring about mass production with its resulting savings.

The real problem seems to be whether or not the railways would buy standard models in sufficient quantity if they were available. The Louisville Railway has answered indirectly in the affirmative, and there is every reason to believe that many companies would welcome a ready source of new cars. The final answer will be determined by price and performance. If the manufacturers offer a standard product from their individual plants at less cost than that of special designs, and if these manufactured cars outpoint the special designs in appearance and performance; that is to say, if they attract passengers and can be run at less cost, there will be no question as to what future car buying practice will be.

Accomplishments Reflected by 80 Operating Statements

CONCRETE evidence of the stability of the electric railway industry is furnished in a digest of the financial reports of 80 individual companies published elsewhere in this issue. These reports, representing nearly three-fourths the total gross revenue of all the electric railways in this country, show that the amount of gross business done by the lines included is almost identical with that done in 1927, while in general expenses have been reduced. Since small, medium-sized and large properties are all incorporated in the list, it presents a fair picture of the industry.

The information given by individual reports is quite different from that found in the industry totals published last month. There the figures were grouped together, so that only averages could be discussed.

Individual reports make it possible to see which properties are making satisfactory progress as compared with the averages. It is notable that size alone is not a measure of the financial success to be expected.

Of course, one property cannot truly be measured in terms of another. Still, the fundamentals are the same. The ideal is to get as much gross business as possible and to keep the expense as low as it may be. These are not considerations that are opposed. It is true that if the effort to keep operating costs low is allowed to degenerate into parsimony the very means defeat the object. There is no general formula which will get the best results. Rather do they follow from a wise policy which, while it always takes into account the need for care in the matter of expenditures, does all that is consistent with keeping the service to a standard that attracts the maximum of business. And this is not all a matter of the physical side. Of course cars must be attractive and the track good. But if the schedules are not carefully arranged and the fare structure nicely fitted to the business possibilities of the territory, unsatisfactory results are bound to follow.

It would indeed be fortunate if experience in the past had furnished a criterion for the scheme of fares under which every company might be expected to make the best possible showing. But unfortunately there has been little progress made in the determination of the principles upon which to base a scientific fare structure. The process of establishing fares has been that of cut-and-try. But even that crude process has been productive of beneficial results when intelligently applied, as the figures in this compilation attest. These figures indicate also that only a relatively small proportion increase in gross with present expenses would put many properties well along the road of satisfactory earnings and financial stability.

Cleveland Mobilizes Its Maintenance Ideas

INTEREST in maintenance practice is increasing steadily. Alert executives realize that during this period of readjustment in the industry maximum efficiency in maintenance is of more importance than ever in determining the color of the net figures for the year's operations.

The maintenance contest conducted by ELECTRIC RAILWAY JOURNAL was conceived with the idea of stimulating interest in better maintenance methods and practices. Winners of departmental prizes in the second period of this year's contest are announced elsewhere in this issue and the contest now enters its final phase. The results of the contest, as indicated by the character of ideas submitted by men from a wide range of properties, have shown beyond all question that it has been very much worth while. It is of particular interest to note that the best showing by individual companies so far has been a direct reflection of the effort made by the managements of various properties to arouse interest in improved methods among their rank and file.

Organized participation by the Cleveland Railway during the period which closed April 15 resulted in the submission from that one company of eighteen ideas out of a total of 43 turned in from thirteen different companies. This illustrates in a striking way the spirit that can be aroused among maintenance forces. But an even more important fact is that these entries from Cleveland won three out of the four department prizes awarded during this period of the contest.

this period of the contest.

Do High Buildings Cause TRAFFIC CONGESTION?

 $\mathbf{B}\mathbf{y}$

E. J. McILRAITH
Staff Engineer Chicago Surface Lines

NE hundred and fifteen years ago the traffic problem was troubling London. A very notable decision at that time expressed the rights of the community to control street use and to prevent parking where standing vehicles become a hindrance to general public convenience in movement along a street. The case involved the right of a stage to stand on the street beside Charing Cross Station while waiting for time to make its return trip. Lord Ellenborough, one of the most noted judges of the

King's Bench, in sustaining a conviction against the operators, stated in May, 1812:

Every unauthorized obstruction of a highway to the annoyance of the King's subjects is an indictable offense. Upon the evidence given, I think the defendant ought clearly be found guilty. The King's highway is not to be used as a stable yard. It is immaterial how long the practice may have prevailed, for no length of time will legitimate a nuisance. A stage coach may set down or take up passengers in the street, this being necessary for public convenience; but it must be done in a reasonable time, and private premises must be procured for the coach to stop in during the interval between the end of one journey and the commencement of another. No one can make a stable yard of the King's highway.

This decision, so often quoted, is not to be considered as an isolated case of that period, but is an effective illustration coming from one of the outstanding English jurists of his time, of the necessity then recognized for regulation of street use in order to retain for the public the principle "that the primary object of the street is for the free passage of the public."

We are still seriously concerned with the working out of that same problem, but it is only in very recent years that the intensity of street use in American cities has given us the threatening difficulty that we call "The Traffic Problem."

It has become a commonplace today to speak of vehicular movements on the street as "traffic." The older meanings of the word referred to business or commerce, or to the movement of goods by railways. It is already a term so generally used that it scarcely needs definition, for it can be applied without misunder-

Neither arbitrary limitation of building heights, nor wholesale street widening offer panaceas for congestion. Automobile usage, not high buildings, is the primary cause of present-day congestion. Analysis of the traffic to various classes of buildings indicates that the character of occupancy has a greater bearing on traffic than has the building height. The remedy for congestion lies in the separation of various classes of traffic. This is entirely practicable in the modern city provided the economic burden is properly distributed.

of movements of vehicles and street cars or even of pedestrians.

EREFROM OF MOVEMENT

standing to the discussion

Freedom of Movement Is Limited

The "traffic problem" that is constantly under discussion or, to put it more accurately, is continually mentioned in conversation and print, is truly a problem with tremendous bearing upon the costs and comforts of modern life. Each citizen is confronted with definite evidence of the growing intensity of use of streets

and highways. The freedom of his movements is limited, whether in town or country, but perhaps few have fully realized the specific reasons for this sudden sense of the inability to go when and where one pleases, quickly and conveniently.

The usual casual answer would be expressed as "too many automobiles" or "too few roads." Both are evidences of the basic reason, "we want to go somewhere and we want to do it in our own automobile." Here is a sudden burst of enthusiasm for automobile travel which has developed within a very few years into a great extravagance in our every-day life.

Of course, it is not the only extravagance that has become an accepted necessity in the American standard of living. Silk clothing, elaborate amusements, costly homes and furnishings, extensive travel, and expensive foods are all considered present-day commonplaces.

That such standards are possible is a remarkable tribute to American methods. There seems every reason to expect even a higher standard of luxury in living for the people of this country, and no arbitrary barriers should be put in the way of developing the best educated and happiest people on the earth with the maximum enjoyment of the best the world affords.

Yet, we must recognize that this enormous growth in automobile use has taxed seriously the capacity of our streets and highways, and must admit that the traffic problem is a direct result of this sudden development of luxury travel in individual vehicles. The improvement of streets and highways should proceed as fast as the



people can afford to pay for them, and yet it is quite obvious that there will always remain a restraint on the speed and convenience of automobile operation in cities because of the frequency of intersections with other streets.

Impossible to Use All Present Autos

The density of population in cities provides an ownership of many automobiles per mile of street, and particularly per mile of through streets or main traffic arteries. The

accompanying table illustrates the present situation in several large American cities.

If every fourth street is an important or heavily

Airplane view of lower Manhattan

Within this small district in New York, the massive, towering buildings constitute the financial capital of the nation. New York's largest banks have been concentrated in an area of a few square blocks. These institutions represent resources of \$10,300,000,000 out of a total of \$14,696,-000,000 for all New York City banks. This concentration is a natural economic trend and indicates the tendency of similar lines of business to group closely together. According to announcement by one of these banks that has recently completed a new towering headquarters building in the financial district indicated, the faster tempo of modern business demands quick clearance of financial transactions and information, which is facilitated by physical proximity.

traveled street (this is a higher proportion than usually exists) then there are in large cities about 800 automobiles available to operate per mile of main routes of travel. If all were out simultaneously there would then be one automobile for each 13 ft. of main route, counting equal traffic in each direction.

The necessities of business require large numbers of commercial vehicles and passenger automobiles to travel about. The luxury of the lives of many people, and the leisure available to enjoy that lux-

mry, creates the habit of traveling by private automobile until the combination of necessary and luxury travel fills the streets beyond a comfortable degree.

Of course, all the world's larger cities have in all ages had some degree of traffic difficulty. The lower speeds of vehicles when horse drawn and the rougher pavements of former periods contributed largely to the congestion in the early days. The faster movement of the vehicles of the present day permits an enormous increase in the number of vehicles that can move along a street in an hour. Yet, the problem of avoiding congestion that has long been a recognized difficulty is becoming of growing importance.

NUMBER OF	AUTOMOBILES-MILES	OF STREET-POPULATI	10.5

City	Year	Population	Automobiles Registered	Automobiles Per Mile of Paved Streets
Chicago St. Louis	1928 1928	3,150,000 848,100	360,600 131,500	135 157
Detroit	1928 1928	1,500,000	390,600 185,000+	283
Boston*	1928	799,200	98,028	256 166
Los Angeles	1928	1,400,000	361,000	270

^{*} City of Boston only. † Approximate.

Major L'Enfant planned in 1791 a remarkably competent system of streets of ample width and with very excellent routings for the city of Washington. It must be evident that he knew from experience the difficulties of city traffic. Napoleon ruthlessly opened great new streets through the heart of Paris prior to 1814 to facilitate communication between the different sections of the city and the districts outside.

It was traffic congestion in addition to the slowness of travel that inspired the building of steam-driven elevated railways in New York which began operating in 1871. At that time the average density of population on Manhattan Island was 42,800 people per square mile. Today the density is 102,000 persons per square mile. People in 1870 did not have the habit of traveling about as much as they do today, or the congestion from wagons, carriages and horses would have been intolerable, for there were few public conveyances and these consisted only of the horse cars and horse-drawn omnibuses.



In 1880 the rides per year per capita on surface cars and rapid transit lines in New York were 150, while with the different habits and standards of living the riding today on public carriers reaches 480 per capita per year. This is some indication of the change in people's ways. Today the citizens of New York use

public facilities more than three times as much per capita as in 1880, despite the greatly improved private vehicles and the enormous use made of private automobiles.

Density of population or even the size of the city are not the only factors to be considered in judging the degree of traffic congestion to be expected. It is true that congestion seems most acute in the larger American cities, yet note the relatively low densities of population as shown in Table I.

Automobile Ownership, Not Population Density, Cause of Congestion

European cities are not like the cities of the United States because the ownership of automobiles is not so general in Europe. Berlin, with a population of 4,000,000, has but 60,000 automotive vehicles including

TABLE I—DENSITY OF POPULATION IN FIVE PRINCIPAL CITIES

City	Per Square Mile
Manhattan—1880	52,000
Manhattan—1927	102,000
Paris	95,000
Berlin	70,000
London (Inner 117 square miles)	38.300
Chicago (average, 1920)	14.805
Chicago (densest square mile)	58.874
Chicago (average central 51 square miles)	27,219
Average of all cities in the United States having populations between 300,000 and 500,000 Average of all cities in the United States having populations	6,912
from 500,000 up.	11,872

motorcycles, as compared with 414,685 in Chicago, which has a population of about 3,150,000. So it is easily apparent that size of city or density of population do not create congestion, but that it is the American desire to use automobiles and the financial ability to realize the desire that creates the present-day degree of traffic intensity. It is striking to note the wide divergence in density of population in various cities, yet all American cities, at least, have a threatened traffic congestion in some sections.

Chicago parked autos

Literally thousands of Chicagoans park their cars at Monroe Street in Grant Park on Chicago's lake front. Acres of ground are covered with autos, the lineup extending as far as the eye can see. In the background of this great parking station is a portion of the rapidly mounting skyline of the Chicago "Loop" district and the newer developments north along the lake front.

trict in each of several large cities for the hour of maximum travel as shown in Table II.

Analysis is not available for each city to show where these vehicles came from or what proportion is traveling through the central district rather than coming from the garages, street parking spaces or other

storage areas in or near the business center.

In Chicago the garage and storage space within or in the immediate neighborhood of the central business district will accommodate at one time 15,981 cars.

TABLE 11—COMPARISON OF UTILIZATION OF CENTRAL DISTRICT VARIOUS CITIES

				—Maxin	um Hour	Per Cent of People
City	Year	Area of Central District	Total Population	Service Vehicles	Total Vehicles	Leaving by Private Auto
St. Louis Detroit Baltimore Boston	1925 1924 1925 1927	0.99 0.58 0.49 0.88	831,800 1,290,000 790,600 *1,187,800	2,722 1,399 1,707	12,253 12,876 8,774 12,436	20.1 24.2 18.1
Chicago Chicago†	1926 1928	0.58 0.58	3,048,000 3,156,400	2,562 2,442	15,742 17,670	9.5 11.2

*Includes seven adjacent communities. † Street parking prohibited after Jan. 10, 1928.

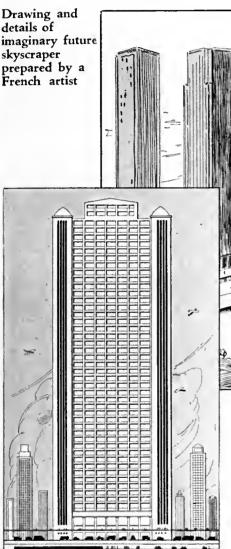
Before the no-parking regulation was placed in effect, Jan. 10, 1928, the curb parking spaces in this district legally open to parking would serve only 1,157 vehicles at one time.

However, checks in 1926 show a rather striking condition as indicated by an accompanying chart. The accumulated number of people within the business district is shown by the higher curve, while the lower curve is a record of that portion of the accumulated people who come by automobile. The maximum

The most of the street traffic was an unnecessary hindrance to the vehicles and pedestrians wanting to do business in that district.

HIGH BUILDINGS NOT NECESSARILY CAUSE OF CONGESTION

High buildings are not necessarily the cause of the traffic problem. This can be demonstrated by analysis of each city or by analyzing traffic in one city as compared to that in another. In Chicago, for example, the



A French artist's conception of the city of the future. Mammoth towers served by high-speed elevators are separated by distances ample to provide light, air and even recreational facilities. Between these towers various classes of traffic are separated on several grades. The artist, while fail-

ing to provide an explanation of the economic plan on which this development of cities could be accomplished, nevertheless shows that limitation of building height is not necessarily the only or the best way of assuring adequate light, air and space for recreation.

number who were present within the district at any time was 360,000, of

which only 7 per cent came by automobile. For the twelve-hour period the average percentage of those present who came by automobile was but 6.5 per cent. Yet, 19.1 per cent of those counted crossing the boundary line when entering the district were in automobiles. So then the majority of those in automobiles entering the district were only passing through to go somewhere else.

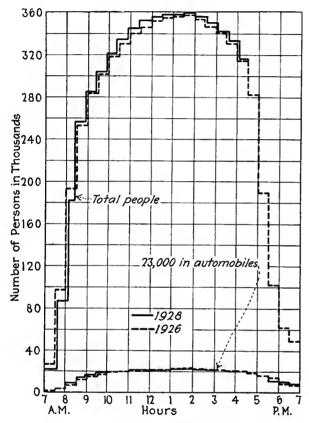
TABLE III—AUTOMOBILE STORAGE CAPACITY OF THE CENTRAL DISTRICT, CHICAGO

 buildings in the financial center on La Salle Street are principally twenty-story office buildings used very intensively. Along State Street are grouped the large department stores and many smaller shops, the buildings averaging eleven stories in height. Yet, for the hour of maximum sidewalk use the number of pedestrians on La Salle is approximately half of that on State Street. Similarly, the vehicular flow in the hour of maximum density is only 57 per cent as great on La Salle as on State Street. The hour of maximum pedestrian movement is between 12 and 1 p.m., and in the evening rush hour the pedestrian movement is usually about 60 per cent of that at noon. The hour of maximum vehicular movement is approximately between 5 and 6 p. m.

It should be pointed out, however, that comparing a retail store having a ground area of 127,000 sq.ft., with a total of thirteen floors above the street with two bank and office buildings having a combined ground area of 110,800 sq.ft. and twenty floors above the street, we find that for the hour of maximum sidewalk use the bank and office buildings contribute proportionately 1.1 per cent more pedestrians per 100,000 sq.ft. of ground area

than the store. Based on relative total floor area available in the two classes of buildings the relative number of pedestrians to and from the bank and office buildings is only 79 per cent of that for the store. These figures are for conditions of a typical day in May, 1928.

The store has 7,600 employees, and at the time when the maximum number of people are in the store there are 13,300 persons within the building. The office buildings have a total listed number of tenants and employees of 15,000, but the maximum number of people in the buildings at one time is 10,200. Based on floor area the bank and office space is used at 71 per



Accumulated people in Chicago Loop district

Comparison of total persons within the central business district of Chicago for half-hour periods throughout the business day, with number carried by automobiles. Observations made on typical business days in May, 1926, and May, 1928, indicate relative small economic importance of automobiles in the business life of America's second largest city, though they are primary causes of the congestion problem. Additional facts available indicate that a considerable proportion of the automobiles which came into the district were merely passing through and had no business in the central area. With adequate by-pass routes available, they could have been rerouted. The chart does not include people walking into the district, which would still further reduce the proportion transported by automobiles.

cent of the intensity of the store space, while based on ground area the bank and office building area is used 88 per cent as intensively as the area occupied by the store. Perhaps conditions would be relatively different if comparing a store selling to a less well-to-do class of patrons. It would be expected that such a store would have more customers per unit of floor area as is indicated from a comparison, described later.

Here we have the strange circumstance that the high office buildings use the land less intensively, but provide more pedestrians in the hour of maximum pedestrian movement, and yet the sidewalks alongside have only half the volume that occurs on the shopping street. The

answer probably is that State Street is a popular street for wandering, for window shopping and for people to use as a highway because they like to go where it is busy.

CLASS OF BUSINESS MORE IMPORTANT THAN HEIGHT OF BUILDING

The sidewalk on the west side of State Street between Madison and Monroe has a greater number of pedestrians for the business day, and also for the maximum hour, which is at noon, than is found on any other block of sidewalk in the central district. Yet, the buildings on this side of this block are largely Class C type and the active floor space in the buildings is very low. The average number of active floors for merchandising along this block is only 2.4 as compared with an average of eleven stories over twelve blocks adjacent on State Street. One building with offices has an entrance on this sidewalk and attracts 3.8 per cent of the persons entering buildings in this block. Yet the total of all persons entering all buildings along this block of sidewalk was 89.9 per cent of the number entering on this sidewalk from the ends of the block.

More interesting is the fact that 75 per cent of all the persons entering all buildings in the block were concentrated in two stores with a total floor area of about 43,000 sq.ft., which sell merchandise ranging in price from 5 cents to \$1. In the same period the highgrade department store building previously referred to, having thirteen floors above the street and more than 2,000,000 sq.ft. of total floor area, had only 1½ times as many people entering. Of course, the money value of the trade involved must be enormously different, yet the pedestrian traffic to these two establishments was in the ratio of 1 to $1\frac{1}{4}$, which is in striking contrast to a floor area ratio of approximately 1 to 50. From these facts it seems obvious that hasty or offhand conclusions as to the causes of traffic congestion are extremely dangerous. Generalizations on this important and complicated problem may be very misleading.

In St. Louis the densest ½ square mile of the central business district has an average building height of 3.8 stories. In Chicago the 0.58 square mile of the central business district averages 7.7 stories in height. The number of automobiles passing outbound from the larger area of St. Louis business district that covers 0.99 square mile is 12,253, in the heaviest evening rush hour, while for the central district of Chicago the number is only 15.742, although the latter city has 3.7 times the population of the former. Analysis shows that under present street arrangements the maximum capacity outbound in Chicago is 65 per cent greater than the number now moving outbound in the rush hour, so that the present conditions do not represent serious congestion.

Traffic Concentration Despite Building Limitation

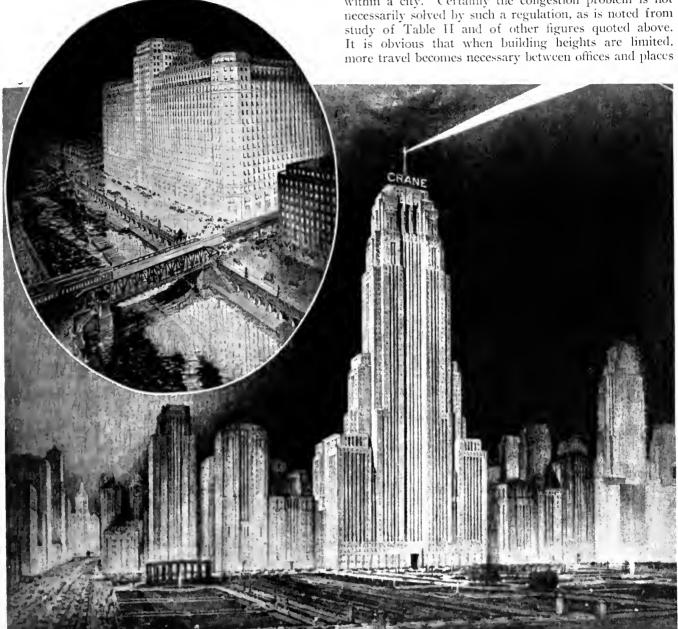
Boston has had a building height limitation of 155 ft. for many years. The average building height for a distance of 1,600 ft. on the busiest street, Washington, is 6.6 stories compared with an average of 11.3 stories for the same distance on State Street, Chicago. The number of pedestrians passing the middle of the busiest block in central Boston between 12 and 1 p.m. was 24,797 for a typical day of 1928. In the busiest block in central Chicago the number of pedestrians was only 23,906 for the same hour, although the city of Chicago has 2.6 times the population of the Boston metropolitan district, consisting of the city proper and seven towns

Marshall Field Merchandising Mart

The Marshall Field Merchandising Mart to be erected in Chicago, which will be by far the largest building in the world, with a total floor area of 4,000,000 sq.ft., affords another striking example of the use of air rights for some of the mammoth sructures planued for the Western metropolis. This building, in which are to be housed wholesale mercantile and manufacturing organizations, is one of several similar enterprises that reflect the tendency of similar lines of business to group themselves in close physical proximity. The merchandise mart will be erected over a freight terminal in the district immediately north of the Chicago River.

with many times the tributary population and all the high buildings and great concentration, the highest price on Fifth Avenue is \$25,000 per front foot and on Broadway near Wall Street it is \$21,000. In Chicago the most expensive frontage averages \$20,000 per front foot. All of these figures are for 100 ft. in depth and eliminating corner influence.

It should be evident that the artificial limitation on the height of buildings may not produce an economically sound result in lowering the costs of doing business within a city. Certainly the congestion problem is not



immediately adjacent. The area of the central business district in Boston is practically the same as in Chicago, and the number of automobiles outbound in the maximum rush hour is 12,436 in Boston and 15,742 in Chicago.

Height limitation may not even place a limitation on land values, and of course if lower buildings occupy expensive land the cost of the land has a greater influence on the costs of business than if larger buildings having more occupants can utilize the expensive area. In Boston the most expensive land averages \$18,500 per front foot, exclusive of corner influence. In New York,

Chicago to Have 75 Story Skyscraper

Chicago is planning a 75-story tower building that illustrates the new note in the architecture of lofty structures providing ample ground area to insure adequate light and air, even when adjacent plots are developed with high buildings. tower, named for the plumbing company that is planning this monument to its business, is expected to cost \$23,000,000. It is to be crected on air rights over the newly electrified Illinois Central Railroad at Randolph Street, and is expected to exceed in height the famous Eiffel Tower of Paris. The artist has sketched in an imaginary skyline of adjacent structures as they may look in the near future. Michigan Avenue is at the left of the illustration, in which the view is looking north from a position in Grant Park on Chicago's lake front.

of business scattered over a greater area, thus actually tending to increase the demand upon street and transit facilities.

HIGH BUILDING CAN SUPPORT ADEQUATE TRANSIT

Higher buildings, with increased floor areas available for renting, can afford to support more intensive development of the streets, which permits the segregation of various classes of traffic so as to bring about much better transportation and traffic conditions. ample, Chicago can afford and is likely to build in the streets of the central district, levels for three separate classes of traffic. The present level will ultimately be given over almost entirely to vehicles. Immediately below will be a complete street width lined with shops and show windows where the pedestrians will have no interference from traffic nor from weather. pedestrians can walk directly across the street from shop to shop or from building to building by the shortest route. Immediately below there will be the subway tubes at a minimum distance down, although there will be one level for north and south lines and a lower level for the east and west routes.

Such a system of development will make the present street widths more than ample for whatever height of buildings may ever be found to be economically desirable. Of course, this statement takes into consideration the greater volume of vehicular flow possible when pedestrians are not a source of interference at intersections and when the public carriers are operating on a level by themselves. Then the excellent system of transportation to be provided by the proposed rapid transit lines and the proposed street car subways will probably reduce the proportion of rubber-tired vehicles operating in this central district to a smaller percentage even than exists at present.

COST ONLY 2 PER CENT OF PRESENT VALUE

Can such a system be justified from the viewpoint of economics? Let us consider this in the light of present values in the principal shopping section on State Street. which is eight blocks long. Assume that this section is a mile in length, for purposes of easy comparison. The proposed subway development would cost at the rate of nearly \$12,000,000 per mile in the central business district. Land on State Street, where the first unit would be built, has an average present value of at least \$20,000 per front foot for a half block of depth, and if the benefits were considered to reach only one block or 400 ft. on each side of the subway the land so closely adjacent to a mile of such street would be worth at least \$308,000,000. The value of the buildings at present on the land is at the rate of \$250,000,000 per mile. What would it be worth to this \$558,000,000 worth of property to improve its accessibility to the extent that would be effected by the several streets and subway levels proposed? What would it be worth to the city as a whole? The cost of the subway and sub-street would be only 2 per cent of the value of the property within 400 ft. of it, and this takes no account whatever of the proportion of the cost which should be assessed against the community as a whole as a general property benefit.

If it were possible to produce the same degree of accessibility by widening of surface streets alone the land value taken for streets would be at least \$475,000,000, and this land would be withdrawn from use for buildings. The reduction in taxable value would then

be at least \$900,000,000. In addition to this serious reduction in taxable value, there would be no adequate method of avoiding serious interference at intersections. It is quite probable that such wide streets would even increase the hazards of traffic movement while offering at best a very poor remedy for one of the primary causes of congestion; namely, interference of various classes of traffic. No system of surface streets can equal the effectiveness in moving traffic that is obtainable by separating traffic on several levels without intersectional interference. No reduction in usable land is necessary for such development, and intensive use of land can be attained with a desirable standard of convenience and accessibility by the use of subways, sub-streets, and separation of intersecting lines of travel.

THE PROBLEM IS COMPLICATED BUT NOT HOPELESS

Automobiles operating as they must on the surface of the streets provide a great convenience, but introduce a serious problem when their use is not regulated. Cities cannot hope to create sufficient street capacity so as to permit each owner to use his automobile for all his movements. The principal streets in cities of all sizes are already more crowded than is comfortable with only a small percentage of the people using automobiles. The limitation on the development of such streets is not only that of prohibitive cost for the community, but also the reduction in land area remaining for buildings in the central district and along major thoroughfares. In fact, the artist's dream of a central district entirely given over to streets would be the result, and then, of course, the city itself would be destroyed.

So we come inevitably to the conclusion that the traffic problem, and the broader problem of outlining a sound policy of city planning and development that shall provide adequate facilities for convenient movement of people and commodities, are neither simple nor yet There are many influences, many seemingly opposite points of view, much mis-information and much misdirected effort. Yet the traffic problem will not cause fundamental upsets in the scheme of city growth and development. It will cause changes that are important and developments that are costly, but such is the history of all our thousands of years of growth into the present state of civilization and comfort. New methods or processes, new equipment, new standards, new producing efficiency have all been operating to create changes and cause adjustments that are sometimes very difficult. But through it all the general good has been steadily promoted.

Modern traffic conditions present a situation to be remedied, a problem to be solved in the interests of the public. If we do not fall into the folly of thinking that it is a disease to be cured by some panacea we may make orderly progress through careful investigation and cumulative adjustments. Systematic relief measures may be undertaken as conditions warrant them, so that a reasonably adequate system of communication may be maintained everywhere. It is a growing, changing problem on individual streets and in individual cities; but the basic principles and practices involved apply universally with proper adjustment to special conditions. Better understanding of these principles and practices will be developed and present mistakes in thinking will be corrected as experience increases. At the present time, however, engineering knowledge of the subject is far in advance of the practices in general use.

Sample Cars for Louisville

Designed to Win Public

Three new cars secured as preliminary step in extensive equipment improvement program. Manufacturers given free hand in effort to stimulate off-peak riding, to effect operating economies and to cultivate good will

PROMPTED by the merchandising philosophy that if modern, comfortable and pleasant equipment is operated during the off-peak hours, additional riding will be encouraged and economies effected, the Louisville Railway has secured three experimental cars, anticipatory of an extensive car improvement and replacement program. In addition to stimulating riding during the base hours and reducing operating expenses, the railway hopes to cultivate public good will by offering the maximum of service compatible with its earnings. The three cars were furnished by the St. Louis Car Company, the G. C. Kuhlman plant of the J. G. Brill Company and the Cincinnati Car Corporation. One of the railway's regular cars will be rehabilitated and mounted on new Timken-Detroit model 52-A trucks with high-speed motors, making four experimental cars in all.

The three manufacturers were requested to build that type of car which, in their estimation, would best provide modern street railway service in Louisville. The cars were to be of light construction, to be mounted on 26-in. wheels, to have comfortable seats and to be built for one-man, two-man operation. In placing the orders the railway made a particular point of giving the manufacturers as free a hand as possible—unhampered by detailed specifications—in the development of designs best suited to the requirements of modern transportation conditions.

The orders were placed during the latter part of February and the deliveries were made on April 1 and April 13 for the St. Louis and Brill cars, respectively. The Cincinnati car has not been delivered at this writing, but is expected daily. All three cars are of the builders' latest designs and represent their conceptions of a vehicle having the greatest merchandising attractiveness. It is the purpose of the Louisville Railway, as soon as it is financially able, to purchase approximately 90 new cars, and to base the specifications for these on the best points of the four experimental cars.

At the present time the railway is in the midst of a fare adjustment, the preparatory work of which has covered a period of eight or nine years. In 1920 this company was seriously handicapped by the limitation of a 5-cent fare. Under the protection of the court, however, a straight 7-cent fare was instituted. In the litigation arising from the company's injunction proceedings, the city offered a compromise in the form of a barometer fund operation based on a predetermined return on the outstanding securities of the company. While not agreeing to the economic soundness of this plan, the railway

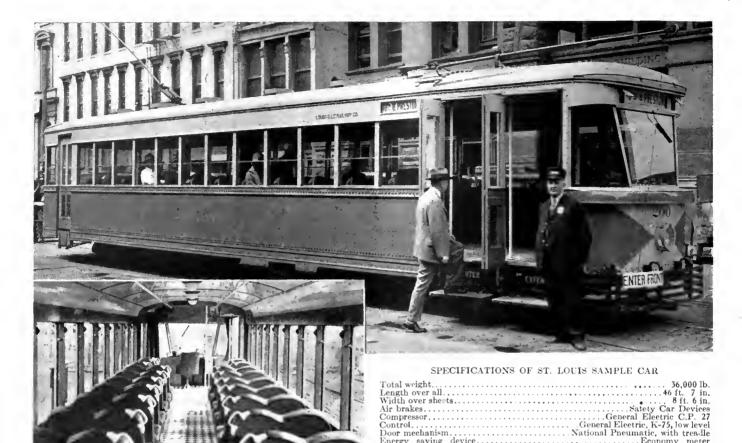
accepted it as a measure of expediency and operated under it for a period of three years. At the end of this time both parties were dissatisfied with the difficulties of administration, and the city adopted a new ordinance requiring that a valuation be made and that a fare be fixed subsequently which would yield a reasonable return on the fair value of property used and useful in the public service. An evaluation was made by the Beeler Organization and the present negotiations with the city are the final phase of the interpretation and enforcement of the terms of this ordinance. Negotiations were proceeding more slowly than the railway had hoped, so it was decided to anticipate a new car program by the immediate purchase and demonstration in service of a few modern equipments.

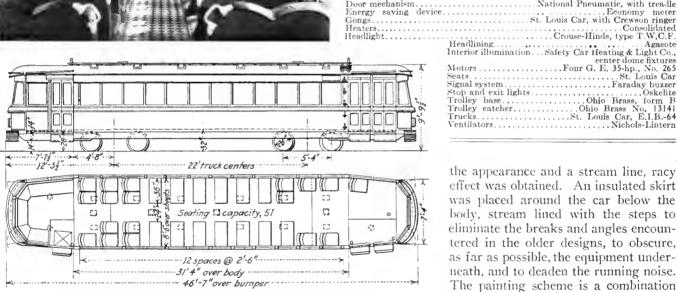
NEW CARS EFFECTIVELY INTRODUCED

When the first car, the St. Louis unit, was delivered, it was placed on exhibition for a day. Then it was tested in service for two days, and placed in regular operation on Sunday, April 7. On Monday morning, between 8 and 9 o'clock, the company instituted a "lucky hour,' carrying all passengers free. Those who boarded the car were asked to give their comments on the effectiveness, comfort and general desirability of the new type of vehicle. As the patrons stepped aboard they were greeted cheerily by the conductor and inspector, who informed the customers, all ready to pay: "Friend, this is your lucky day! This ride is free with the compliments of the company. Look the car over and let us know any suggestions you have for improving it for your convenience." The company received a large and pleasant response, justifying almost immediately the belief that the new type of car would reawaken public interest in street car transportation.

The new car was rotated on the various lines in the city, keeping it on each line for three or four days and getting as completely as possible the reaction of the public to it. The same procedure was followed on the second car when delivered, and will be followed when the other two cars are ready for service. By this means the railway hopes to learn from the public which features in all four cars it most desires.

While demonstrating the new vehicles, the railway let it be known that as soon as its financial house is in order, arrangements will be made to equip all-day schedule service with new cars. Another important factor made known was that the fare adjustment would be needed either before, or concurrently with, arrangements for





Views and drawings of the sample car furnished the Louisville Railway by the St. Louis Car Company

refunding the first mortgage bond issue, which matures in the summer of 1930, to insure proper financial adjustment. Fundamentally, the railway believes that if all the equipment used during the base hours is strictly modern, and a large proportion of the cars used in the rush-hour service are new, it can build up its off-peak riding and reduce its operating costs sufficiently to carry the cost of the equipment, so that no increment of increased fare would be required for the modernization of all-day service.

APPEARANCE STRESSED IN St. Louis Design

The car furnished by the St. Louis Car Company is a single-end, double-truck car with a seating capacity of 51 and is mounted on the company's standard E.I.B. trucks. In the design, particular attention was given to

the appearance and a stream line, racy effect was obtained. An insulated skirt was placed around the car below the body, stream lined with the steps to eliminate the breaks and angles encountered in the older designs, to obscure, as far as possible, the equipment underneath, and to deaden the running noise. The painting scheme is a combination of blue for the body and skirts, ivory for the center work and letterboard, tan for the roof and black striping on

Headlining Agasote
Interior illumination Safety Car Heating & Light Co.,

Interior illumination Safety Car Heating & Light Co.,
eenter dome fixtures
Motors Four G. E. 35-hp., No. 265
Seats St. Louis Car
Signal system Faraday buzzer
Stop and exit lights Oskehite
Trolley base. Ohio Brass, form B
Trolley eatcher Ohio Brass No. 13141
Trucks St. Louis Car, E.I.B.-64
Ventilators Nichols-Lintern

the skirts, belt rail and letterboard. The car front has a wide, sloping window and an automotive type bumper.

The interior finish of the car is natural ash with light straw ceiling. The seats, furnished by the car company, are of the deep overstuffed type with spring cushions and backs, and are upholstered in genuine leather with Hyoline grain. There are nineteen cross seats, six single seats, and seats in the rear to accommodate seven.

The car is designed for single-end operation and all apparatus at the front end is inclosed in a special control cabinet. The flooring throughout is of blue and white rubber tiling. The platform and body floors are continuous, a 2-in. ramp extending from the bolster centers to the body corner posts. A second 2-in. ramp extends across the platform transversely, making the step height 14 in. for both front and rear. Folding

steps are used at both doors, and an automatic treadle controls the rear exit door. The operation of the front door is selective through a valve attached to the M-28 brake valve. A secondary valve gives the motorman further control over the rear exit door.

The car is 46 ft. 7 in. overall, 31 ft. 4 in. over body corner posts, 8 ft. 6 in. wide over side sheets, 9 ft. $9\frac{1}{2}$ in, from rail to top of roof and 6 ft. 10 in, from floor to ceiling. It weighs 36,000 lb., completely equipped.

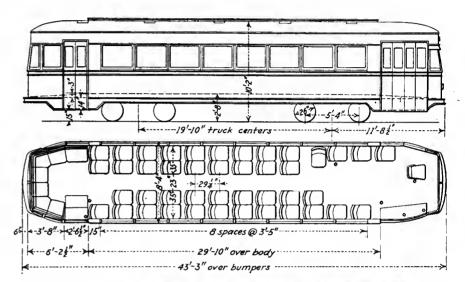
Two vestibule cab heaters are installed at the front end and 26 cross-seat heaters are distributed under the

body and rear vestibule seats. Five double-lamp center-dome fixtures are located in the center of the body, with smaller dome fixtures in the vestibule. An illuminated "exit at rear" sign is carried in the interior on the header at the front and a stop light is mounted in the center of the rear dash. The trolley bases are a new light type, mounted on rubber seats.

St. Louis Car Company type E.I.B.-64 trucks with cast-steel equalizers having a special feature in the mounting of the detachable journal boxes are used. This feature accommodates both a plain friction journal bearing or an anti-friction bearing. The side frames are of cast steel with gussets and brackets for transoms,

brake and bolster suspensions cast integral. The transoms are rolled-steel bulb beams. There are only four joints in the entire truck frame. All wearing surfaces are fitted with renewable heat-treated high-carbon steel wear-plates and bushings. The truck is equipped with a fully graduated system of springs, consisting of a combination of full elliptic and helical springs, which afford an easy riding truck under all loads. Brake gearing is inside hung and fitted with anti-rattle devices.

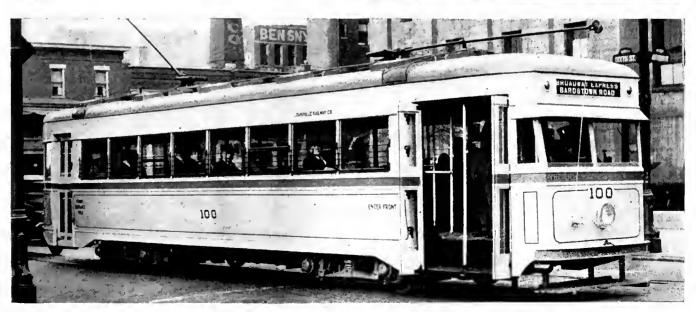
Four General Electric 35-hp. No. 265 motors, inside hung, are installed. The control is General Electric



	SPECIFICATIONS	OF	BRILL	SAMPLE	CAR	
i~h+						

Total weight. 34,000 lb. Length over all. 43 ft. 3 in.
Length over all
Width over all
Air brakes
Car signal systemFaraday
Compressors
Control
Destination signs
Door mechanismNational Pneumatic
Energy saving device
Governor
Heaters
11eadlight
Motors
SeatsBrill, type 301
Signals
Trolley catcheraOhio Brass
Trolley base
Trucks Brill 177E, Timken bearings
Ventilators Rrill



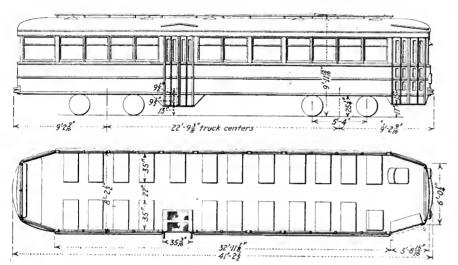


Details of the car built in the G. C. Kuhlman plant of the J. G. Brill Company are shown in this group of illustrations

K-75, low level. The car also is equipped with silent gears, in which a hollow web is filled with noise absorbing material.

BRILL CAR ONE OF STANDARD UNITS

The car built in the G. C. Kuhlman Car Company plant of the J. G. Brill Company is a single-end, double-truck car, with a total seating capacity of fifty. It is designed in accordance with the company's new standardized line of cars, described in the January 26 issue of Electric Railway Journal, and is the first car of this type built with these specifications. The principal features of the car are its distinctive architecture with



Floor plan and side elevation of the car furnished by the Cincinnati Car Corporation



The trucks under the Cincinnati car are the company's standard type with aluminum diamond frames, gusset plates and transom angles

curved sides below the belt rail, the sloping windshield type of vestibule in two parts, the wide single metal side sash, the well-type stationary step and the all-steel interior finish, painted brown to harmonize with the leather-upholstered seats.

The length of the car over bumpers is 43 ft. 3 in., the length over body corner posts 29 ft. 10 in., the truck wheel base 5 ft. 4 in., the truck centers 19 ft. 10 in., the width over posts at belt rail 8 ft. 4 in., the width overall 8 ft. $5\frac{1}{2}$ in. and the height from rail over trolley boards 10 ft. $5\frac{1}{8}$ in. The height of the first step is 15 in. and that of the second 14 in. The total weight is approximately 34,000 lb.

Wide side windows and the brown color scheme, harmonizing with the seats, give the interior a pleasing appearance. The car has eighteen cross seats, seven single seats and a circle of seats in the rear accommodating seven, giving a total seating capacity of fifty. The cross seats are all of the semi-bucket, deep-cushioned type, upholstered in deep buff, genuine leather.

Full vision is afforded the rider by the eight large windows on each side of the car body proper. In addition to these windows there are two single stationary sash, slightly inclined, located in each vestibule end, four smaller stationary windows in the vestibule corners, two windows on the left side of each vestibule and one on the right side of the rear vestibule.

Equipped with 26-in. diameter wheels, the car floor is only 2 ft. 8 in. above the rail. Access to the car is afforded by two steps, one 15 in. above the rail and the other 14 in. to the platform floor. A 3-in. ramp extends to a point between the end sills and the body bolster. A stationary well step is provided at each of the two door-

ways. The folding doors are hung on ball bearings with metal shafts and are joined by ball-bearing hinges.

Brill No. 177-E-1-X four-wheel pivotal type trucks with a 5-ft. 4-in. wheel base are used. Journals are Timken anti-friction bearing type. The truck has swinging bolsters with guides to control their movement and a graduated spring system of combination coil and plate springs. The motor equipment consists of four 35-hp. General Electric motors, type 265. They are axle mounted and have single reduction drive.

CINCINNATI CAR OF ALUMINUM

The car being furnished the Louisville Railway by the Cincinnati

Car Corporation is a single-end, double-truck car, with a seating capacity of 53. The trucks, as well as the car body, are all aluminum, giving a light weight for the unit. The car also varies from the other two in another important feature; the exit door is located to the rear of center, instead of at the rear. Both the front and side doors are of the double folding type.

The car has a total length of 41 ft. $2\frac{1}{2}$ in. and measures 32 ft. $11\frac{7}{8}$ in. over the body corner posts. The width at the belt rail is 8 ft. $2\frac{1}{2}$ in., and the height is 9 ft. $11\frac{15}{16}$ in. The trucks have a wheel base of 5 ft. 4 in., and the truck centers are 22 ft. $9\frac{3}{8}$ in.

The front of the car with its two-piece window, sun visor, two headlights and automotive type bumper has an attractive appearance. The rear of the car also is fitted with two large windows, with a side window on each side of the rear vestibule. A similar side window is located at the left of the operator's seat in the front vestibule. On the left, or devil strip side of the car, are twelve windows, while on the right side there are eleven, the twelfth space being used for the treadle-operated side door.

The seats, which are of the semi-bucket type, are upholstered in brown, genuine Spanish grain leather. The car has twenty-two double cross seats, a single seat near the front and a long seat in the rear. The motorman's seat is of the adjustable type and is upholstered in the same leather as the other seats. Ample ventilation is afforded by ten ventilators in the roof and four louvers, two on the front and two on the rear of the car. The car heaters are of the panel type.

Trucks for the car are the standard Cincinnati type with aluminum diamond frames, gusset plates and transom angles. Wheel bearings are of the roller type. The motors, which are inside hung, were supplied by the General Electric Company and are the No. 265 type

Annual Reports of

80 Electric Railways

Financial results for nearly threequarters of the industry show continued progress, with gross revenues equal to those of the previous year. Operating ratios are lower on many properties. Operating net is up more than \$1,000,000 for the year 1928 over 1927

History are 1928 have been made public by many of the electric railway systems. While these reports differ somewhat in form, being prepared in some instances for security holders, in others for the state utility commissions, and in still others for the city authorities, they are fairly comparable. Together they give a picture of the results obtained by the industry during the past year. In general, also, they make comparisons with the year 1927. Where comparisons are not included in the pamphlet reports they nearly always are available in the published reports of the preceding year.

In the past it has been the practice of this paper to publish such reports from time to time, as they appear,

Reviewed

treating each one individually. This year it has been considered of greater value to the reader to group as many of them as possible, so as to permit comparisons, not only of one year with the previous one for an individual property, but of properties one with another.

In all, information has been collected covering 80 properties. While not every item in the standard form is given in every instance, the relatively few omissions do not reduce to any great extent the value of the information. A considerable number of other railways do not publish separate reports, and their operating results are included only in the reports of larger utilities or holding companies of which they are subsidiaries. It is not possible to include reports of this type, because of the meager information available relative to the railway system. Companies usually do not separate railway expenses and taxes, and even when the gross income after taxes is given, its distribution seldom is shown separately.

The 80 properties included in the survey, however, have prepared reports that are sufficiently complete to

TABLE	I-RANGE	OF	OPERA	TING	RATIOS	IN	1928,	ARRANGED
	ACCO	RDIN	C TO	SIZE	OF PROI	PER	TIES	

	- A			
	Less Than \$1,000,000	\$1,000,000 to \$10,000,000	More Than \$10,000,000	Grand Total
Total number of companies	18	41	21	80
Range of operating ratios in per cent: Above 100	2 4 7 3	1 8 18 5 8	0 0 3 11 4 3	3 5 18 32 11

TABLE II—SIGNIFICANT CHANGES IN OPERATION, CLASSIFIED ACCORDING TO SIZE OF PROPERTIES, 1927-1928

ACCORDING TO		ual Gross Reve		
	Less Than	\$1,000,000 to \$10,000,000	More Than	Grand Total
Total number of companies	. 18	41	21	80
Gross revenue: Increased in 1928 Decreased in 1928 Figures not available	. 12	8 33 0	9 12 0	22 57 1
Operating expenses: Increased in 1928 Decreased in 1928 Figures not available	. 15	10 23 8	9 9 3	21 47 12
Net revenue: Increased in 1928 Decreased in 1928 Figures not available	. 7	15 18 8	12 3	31 37 12

TABLE HI—DIVIDENDS PAID IN 1928 BY COMPANIES INCLUDED IN SURVEY

Name of Company Denver Tramway	Class of Stock Pfd. Common Pfd. Common	Rate, Per Cent 3 7	Amount \$313,236 840,000 425,000 455,000
Chicago Rapid Transit Company	Pfd. N. C. Prior lien	6 7	489,484 373,422 490,000 67,514
Louisville Railway	Common Pfd, Common	5 2	14,533 175,000 166,472
Androscoggin & Kennebee Ruilway. Boston Elevated Railway. Holyoke Street Railway. Union Street Railway, New Bedford. Springfield Street Railway, Springfield, Mass. Grand Rapids Railroad.	Common Pfd.	3 7 7	88,110 3,145,726 26,840 73,125 186,188 10,276
Duluth Street Railway Duluth-Superior Traction Company Twin City Rapid Transit Company, Minne- apolis, Minn	Pfd. Pfd. Pfd. Common	7 4 7 2	35,000 60,000 210,000 440,000
Brooklyn City Railroad Brooklyn-Manhattan Transit Corporation	Common Pfd. Common	1 6 4	160,000 1,496,808 3,079,644
Hudson & Manhattan Railroad. Cincinnati Street Railway Cleveland Railway. Community Traction Company, Toledo, Ohio. Philadelphia Rapid Transit Company.	Common Common Pfd. Pfd. Common	1 5½ 6	999,888 1,227,700 1,972,986 87,955 2,100,000 2,305,182
Montreal Tramways Honolulu Rapid Transit Company		10 7	550,000 1 7 5,000
Total for 24 companies			\$22,240,089

	Tracti	Smith ion Co. iith, Ark.	Fresno Tra Fresno	, Cal.	Los Ang Los Ange	geles By. eles, Cal. 1927	Pacific El Los Ange	ectric Ry. eles, Cal. 1927	San Fran'e Callsto Napa, 1928	ga Ry.
Railway operating revenue Railway operating expenses	\$180,310	1927 \$206,230 198,557	1928 \$311,897 300,561	1927 \$324,071 313,268	\$13,175,162 11,002,575		\$18,310,987 15,876,041	\$19,614,541 16,351,454	\$215,481 157,789	\$221,320 161,291
Net revenue, railway oper	\$21,627	\$7,673	\$11,335	\$11,802	\$2,172,587	\$2,225,588	\$2,434,946	\$3,263,086	\$57,691	\$60,028
Net revenue, auxiliary oper Taxes			19,053	19,729	833,675	814,347	1,138,742	1,113,665	12,098	12,782
Operating income Non-operating income			\$7,718	\$8,927 10,214	\$1,338,912 180,949	\$1,411,240 206,136	\$1,296,204 384,523	\$2,149,421 243,797	\$45,592 13,153	\$47,245 9,165
Gross income				\$1,287 51,196	\$1,157,963	\$1,205,104	\$1,680,727 2,913,780	\$2,393,218 3,990,021	\$32,449	\$38,080
Net income Operating ratio, per cent	88.0	96.3	96.4	\$49,909 96.4	83.5	83.2	\$1,133,053 86.7	\$596,703 83.4	73.2	72.9
	Trans Oaklan	System sit Co. nd, Cal.	Petaluma Rosa I Petalum	R.R. na, Cal.	San Diego E San Die	go, Cal.	Califor Cable San Franc	R.R. Isco, Cal.	Market S San Franc	isco, Cal.
Railway operating revenue Railway operating expenses		1927 \$7,452,821 5,852,550	1928 \$624,037 462,440	1927 \$594,199 446,033	1928 \$1,659,767 1,384,800	1927 \$1,676,501 1,381,324	1928 \$514,109 442,734	1927 \$521,905 539,594	1928 \$9,754,460 7,746,612	1927 \$9,819,570 7,640,858
Net revenue, railway oper		\$1,600,271	\$161,596	\$148,165	\$274,967	\$295,176	\$71,375	\$17,689	\$2,007,848	\$2,178,712
Net revenue, auxiliary oper Taxes		432,335	38,313	32,746	120,086	124,387	33,431	40,283	607,000	605,000
Operating income Non-operating income		\$1,167,936 146,453	\$123,283 15,261	\$115,418 10,596	\$154,880 96,944	\$170,789 92,266	\$37,943	\$57,972	\$1,400,848 25,924	\$1,573,712 40,881
Gross income Deductions from gross income	\$1,239,065	\$1,314,389	\$138,544	\$126,014	\$251,824	\$263,055			\$1,426,772 1,296,994	\$1,614,593 1,356,435
Net income Operating ratio, per cent		\$579,017 78.6	74.1	75.1	83.4	82.4	86.1	103.1	\$129,778 79.4	\$258,158 77.9
	San Fra Sacrame San Franc		San Jose I San Jos		Santa Ba Suburb Santa Bar		Denver T Denver		Fort C Municip Fort Colli	pal Ry.
Railway operating revenue	1928 \$844,090	192 7 \$908,936	1928 \$359,326	1927 \$366,881	1928 \$132,937	1927 \$124,658	1928 \$4,310,040	1927 \$4,390,016	1928 \$19,106	1927
Railway operating expenses		919,666	295,035	306,613	124,476	123,949	2,852,496	2,940,084	30,388	••••••
Net revenue, railway oper Net revenue, auxiliary oper Taxes	#43,094 47,543	\$10,729 45,309	\$64,290 24,231	\$60,267 24,943	\$8,461 \$8,339	\$709 8,332	\$1,457,544 506,504	\$1,449,932 523,460	\$11,281	• • • • • • • • • • • • • • • • • • • •
Operating income Non-operating income	\$90,637	\$56,039	\$40,058 1,912	35,324 1,461	\$122	\$7,623	\$951,040 39,077	\$926,472 41,413		• • • • • • • • • • • • • • • • • • • •
Gross income			\$41,970	\$36,785	•••••		\$990,118 \$529,158	\$967,885 \$485,720		
Net income	105.1	101.2	82. 1	83.5	93.6	99.5	\$460,960 66.1	\$482,165 67.0	158.9	
	Connect					an Du f	Inckso	nville	Ch L	urora &
		en, Conn.	Capital Tra Washingto	on, D. C.	Washingto Elec. Washingto	on, D. C.	Tractic Jacksonv	n Co. ille, Fla.	Elgin Aurora	ı, III.
Railway operating revenue Railway operating expenses	1928 \$13,734,222	e n, Conn. 1927			Elec.	Co.	Tractic	n Co.	Elgin Aurora 1928 \$2,802,845	
Railway operating expenses Net revenue, railway oper	1928 \$13,734,222 10,759,127	e n, Conn. 1927 \$14,185,034	Washingto 1928 \$4,344,148	927 \$4,479,099	Fiec. Washingto 1928 \$5,783,826 4,731,042 ³ \$1,052,784	5. Co. 1927 \$5,865,430 4,846,6131 \$1,018,817	Tractic Jacksonv 1928 \$1,199,516	on Co. ille, Fla. 1927 \$1,378,181	1928 \$2,802,845 2,447,298 \$355,546	\$2,813,486 12,560,753
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper	1928 \$13,734,222 10,759,127 \$2,975,095	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167	\$1,379,525 370,789	Flec. Washington 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$5,865,430 4,846,6131 \$1,018,817 1,300,683	1928 \$1,199,516 1,077,9251 \$121,591	9th Co. 1927 \$1,378,181 1,228,6881 \$149,493	**Elgin Auror: 1928	1927 \$2,813,486 12,560,753
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income	\$13,734,222 10,759,127 \$2,975,095	1927 \$14,185,034 11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167	\$1,379,525	Flec. Washington 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	5. Co. 1927 \$5,865,430 4,846,6131 \$1,018,817 1,300,683	Tractic Jacksonv: 1928 \$1,199,516 1,077,9251 \$121,591	90 Co. 111e, Fla. 1927 \$1,378,181 1,228,6881 \$149,493	1928 \$2,802,845 2,447,298 \$355,546 6,397	1927 \$2,813,486 12,560,753
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income Gross income	1928 \$13,734,222 10,759,127 \$2,975,095 725,357 \$2,249,738	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868 698,934 \$1,922,939	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202	\$1,379,525 \$1,009,236	Filec. Washing to 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$5,865,430 4,846,6131 \$1,018,817 1,300,683 \$2,319,594	Tractic Jacksonv 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154	en Co. 111e, Fla. 1927 \$1,378,181 1,228,6881 \$149,493 8,7652 \$140,728	**Elgin Auror: 1928	\$2,813,486 12,560,753 \$2,82,733
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income Non-operating income Gross income Deductions from gross income Net income	\$13,734,222 10,759,127 \$2,975,095 \$2,975,357 \$2,249,738 154,641 \$2,404,380 1,373,431	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868 698,934 \$1,922,939 56,984 \$1,979,918	Washingto 1928 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126	\$1,379,525 \$1,009,236 43,033 \$1,052,269	Eléc. Washingt. 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$5,865,430 4,846,6131 \$1,018,817 1,300,683 \$2,319,594	Tractic Jacksonv. 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154	\$1,378,181 1,228,6881 \$1,49,493 \$1,40,728	Elgin Auror: 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265	\$252,733 170,521 \$423,254
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income Non-operating income Gross income Deductions from gross income Net income	1928 \$13,734,222 10,759,127 \$2,975,095 	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126 353,720 \$620,406	\$1,092,574 \$1,379,525 \$1,379,525 \$1,009,236 \$1,009,236 \$43,033 \$1,052,269 344,814 \$707,454 69.1	Eléc. Washingt. 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$1,018,817 1,300,683 \$2,319,594 746,429 \$1,573,065	Tractik Jacksonv 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154 164,018 \$48,864	\$140,728 \$173,809 \$140,728 \$140,728 \$140,728 \$140,728 \$140,728 \$140,728 \$173,090 \$32,362	Elgin Aurori 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265 \$477,119 439,072 \$38,047	\$2,813,486 \$12,560,753 \$2,82,733 \$170,521 \$423,254 \$80,505 \$42,749
Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income Gross income Deductions from gross income Net income Operating ratio, per cent	1928 \$13,734,222 10,759,127 \$2,975,095 725,357 \$2,249,738 154,641 \$2,404,380 1,373,431 \$1,030,948 78.4 Chleago Trausi Chleago	en, Conn. 1927 \$14,185,034 \$11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126 353,720 \$620,406 70.3 Chicago Sur Chicago Sur	\$1,927 \$4,479,099 3,099,574 \$1,379,525 \$1,009,236 43,033 \$1,052,269 344,814 \$707,454 69.1 face Lines ³ o, fil.	Elec. Washingt. 1928 \$5,783,826 4,731,042! \$1,052,784 1,431,367 \$2,484,151 \$2,484,151 \$1,733,967 East St. Suburb. East St. I	\$1,018,817 \$1,573,065 \$1,573,065 \$1,573,065 \$1,573,065 \$2,319,594 \$1,573,065	Tractik Jacksonv 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154 \$115,154 644,018 \$48,864 Chicago No & Milwau Highwo	\$1,378,181 1,228,6881 \$1,228,6881 \$149,493 \$1,40,728 \$173,090 \$32,362 \$140,728	Elgin Auror: 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265 \$477,119 439,072 \$38,047 87,3 Union Tracof Ind	\$2,813,486 12,560,753 2,560,753 3252,733 170,521 \$423,254 380,505 \$42,749
Net reveaue, auxiliary oper Taxes	1928 \$13,734,222 10,759,127 \$2,975,095 725,357 \$2,249,738 154,641 \$2,404,380 1,373,431 \$1,030,948 78.4 Chleago Traus; Chleago 1928 \$19,995,276 14,238,630 \$5,756,646	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126 353,720 \$620,406 70.3 Chicago Sur Chicago 1928 \$62,391,622 45,401,067 \$16,990,555	\$1,009,236 43,033 \$1,009,236 43,033 \$1,009,236 43,033 \$1,009,236 43,033 \$1,052,269 344,814 \$707,454 69.1 \$10,100,100 \$10,100,100 \$10,278 \$61,624,752 45,331,496 \$16,293,256	Elec. Washingt. 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$1,018,817 \$2,319,594 \$1,573,065 \$1,200 \$4,846,6131 \$1,018,817 \$1,300,683 \$2,319,594 \$2,319,594 \$1,573,065 \$1,573,065 \$2,319,594 \$1,573,065 \$1,573,065 \$1,573,065 \$1,573,065 \$1,573,065 \$1,573,065 \$1,573,065	Tractic Jacksonv. 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154 164,018 \$48,864 Chicago No & Milwau Highwo 1928 \$7,967,186 5,928,424	\$1,378,181 1,228,6881 \$1,49,493 \$1,40,728 \$140,728 173,090 \$32,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 174,090 174,090 174,	Elgin Auror: 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265 \$477,119 439,072 \$38,047 87.3 Union Tracof Ind Anderso: 1928 \$2,805,320 2,504,517 \$300,803	\$252,733 170,521 \$423,254 380,505 \$42,749 \$252,733 170,521 \$423,254 380,505 \$42,749 \$2,951,206 2,708,360 \$242,846
Railway operating expenses Net revenue, auxiliary oper Taxes Operating income Gross income Deductions from gross income Net income Operating ratio, per cent Railway operating revenue Railway operating expenses Net revenue, railway oper Net revenue, auxiliary oper Taxes Operating income	1928 \$13,734,222 10,759,127 \$2,975,095 725,357 \$2,249,738 \$2,404,380 1,373,431 \$1,030,948 78.4 Chicago Trausl Chicago 1928 \$19,995,276 14,238,630 \$5,756,646 \$1,843,112 \$3,913,534	en, Conn. 1927 \$14,185,034 \$11,563,166 \$2,621,868	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126 353,720 \$620,406 70.3 Chicago Sur Chicago Sur Chicago 1928 \$62,391,622 45,401,067 \$16,990,555 \$3,560,000 \$13,430,555	\$1,099,574 \$1,379,525 \$1,379,525 \$1,009,236 \$1,009,236 \$43,033 \$1,052,269 344,814 \$707,454 69.1 \$1,027 \$61,624,752 \$61,624,752 \$16,293,256 \$2,900,000 \$13,393,256	Elec. Washingt. 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367 \$2,484,151 750,196 \$1,733,967 East St. Suburb. East St. I 1928 \$4,358,457 2,977,474 \$1,380,983 \$334,100 \$1,046,883	\$2,319,594 746,429 \$1,573,065 *1,303,778 \$2,37,959 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$1,573,065 **** \$2,319,594 \$1,573,065 **** \$2,319,594 \$1,573,065 **** \$2,319,594 \$1,573,065 **** \$2,319,594 \$1,015,812	Tractic Jacksonv. 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154 164,018 \$48,864 Chicago No & Milwau Highwo 1928 \$7,967,186 5,928,424 \$2,038,761 \$395,596 \$1,702,767	\$1,378,181 1,228,6881 \$1,49,493 \$1,40,728 \$140,728 173,090 \$32,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,462 \$140,728 173,090 \$52,462 \$140,728 173,090 \$52,462 \$140,728 173,090 \$52,462 \$140,728 173,090 \$52,462 \$140,728 \$140,728 \$140,728 \$140,728 \$173,090 \$52,462 \$140,728 \$140,728 \$173,090	Elgin Auror: 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265 \$477,119 439,072 \$38,047 87.3 Union Tracof Ind Anderso: 1928 \$2,805,320 2,504,517 \$300,803 \$102,694 \$198,108	\$2,813,486 12,560,753 2,560,753 3252,733 170,521 \$423,254 380,505 \$42,749 ction Co. lana n, Ind. 1297 \$2,951,206 2,708,360 \$242,846 \$98,000 \$144,846
Railway operating expenses Net revenue, railway oper Taxes Operating income Non-operating income Gross income Deductions from gross income Net income Operating ratio, per cent Railway operating revenue Railway operating expenses Net revenue, railway oper Taxes	1928 \$13,734,222 10,759,127 \$2,975,095 725,357 \$2,249,738 154,641 \$2,404,380 1,373,431 \$1,030,948 78.4 Chicago Trausi Chicag 1928 \$19,995,276 14,238,630 \$5,756,646 \$1,843,112	en, Conn. 1927 \$14,185,034 11,563,166 \$2,621,868 698,934 \$1,922,939 56,984 \$1,979,918 1,451,901 \$528,017 81.5 Papid att Co. 20,011,911 14,189,150 \$5,822,760 \$1,767,948	Washingto 1928 \$4,344,148 3,054,981 \$1,289,167 346,965 \$942,202 31,924 \$974,126 353,720 \$620,406 70.3 Chicago Sur Chicago Sur Chicago 1928 \$62,391,622 45,401,067 \$16,990,555 \$3,560,000 \$13,430,555 2,805,7224	\$1,009,236 43,033 \$1,009,236 43,033 \$1,009,236 43,033 \$1,009,236 43,033 \$1,052,269 344,814 \$707,454 69.1 \$1,027 \$4,027 \$1	Elec. Washingt. 1928 \$5,783,826 4,731,0421 \$1,052,784 1,431,367	\$2,319,594 \$1,573,065 \$1,300,683 \$1,018,817 \$2,319,594 \$2,319,594 \$2,319,594 \$2,319,594 \$1,573,065 Louis & an Co.6 ouls, III. 1927 \$4,397,045 3,093,267 \$1,303,778	Tractik Jacksonv 1928 \$1,199,516 1,077,9251 \$121,591 6,4372 \$115,154 164,018 #48,864 Chicago No & Milly Mily Mily Mily Mily Mily Mily Mil	\$1,378,181 1,228,6881 \$1,49,493 \$1,40,728 \$140,728 173,090 \$32,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 173,090 \$52,362 \$140,728 174,090 174,090 174,	Elgin Auror: 1928 \$2,802,845 2,447,298 \$355,546 6,397 121,294 \$227,853 249,265 \$477,119 439,072 \$38,047 87.3 Union Trac of Indi Anderso 1928 \$2,805,320 2,504,517 \$300,803	\$252,733 \$2,813,486 12,560,753 \$252,733 170,521 \$423,254 380,505 \$42,749 \$42,749 \$2,951,206 2,708,360 \$242,846

Italic figures indicate deficit or entries opposite the general account.
Includes taxes.
City of South Jacksonville proportion.

⁸Combined statements of Chicago Rallways and South Side Lines for distribution of Income; years ended Jan. 31.

⁴Includes city's 55 per cent of divisible net recelpts, \$2,556,245.

⁸Includes city's 55 per cent of divisible net recelpts, \$2,100,224.

⁸Includes subsidiary companies.

Table IV (Continued)—Condensed Financial Reports of Electric Railway Properties, 1927-1928

-	Raily Gary,	Indiana Gary Railways Gary, Ind. 1928 1927		Indianapolis Street Ry. Indianapolis, Ind. 1928		Terre Haute, Ind'p'l's & Eastern Trac. Co. Indianapolis, Ind. 1928		edar Falls ern Ry. o, lowa	Louisville Railway Louisville, Ky. 1928 1927	
Railway operating revenue Railway operating expenses	\$1,240,522 970,534	\$1,275,769 1,010,563	\$5,213,776 3,857,221	\$5,414,671 4,177,977	\$5,122,184 4,119,917 ¹	\$5,674,386 4,629,2311	1928 \$1,123,437 882,682	\$980,910 834,009	\$4,749,361 3,334,341	\$4,812,195 3,260,563
Net revenue, railway oper Net revenue, auxiliary oper Taxes	\$269,988 63,113 ⁷	\$265,206 84,206 ⁷	\$1,356,555 289,303	\$1,236,694			\$240,755 37,021	\$146,901 39,991	\$1,415,020 64,043 461,000	\$1,551,632 85,977 461,000
Operating income Non-operating income	\$206,875 2,416	\$181,000	\$1,067,252	\$940,770	\$1,002,267	\$1,045,155	\$203,734	\$107,020	\$889,977 86,107	\$1,004,654 83,518
Gross income Deductions from gross income	\$209,291 118,609	\$181,000 84,282	\$1,067,252 663,839	\$940,770 639,914		\$1,045,155 1,125,651			\$976,084 643,033	\$1,088,172 656,679
Net income Operating ratio, per cent	\$90,682 78.2	\$96,718 79,2	\$403,413 74.0	\$300,856 77.2		\$80,496	78.6	85.0	\$333,051 70.2	\$431,493 67.8
4	Portland Portlan	d, Me.	Lewisto	bec Ry. on, Me.	Electi Baltime	allways & rle Co. ore, Md.	Wash'n, Annapoli Baltimo	s El. Ry. re, Md.	Bos Elevato Boston	ed Ry. , Mass.
Railway operating revenue Railway operating expenses		1927 \$1,296,429 1,035,013	1928 \$822,922 680,943	1927 \$921,941 744,580	-1928_ \$16,273,806 10,873,921	1927 \$16,189,741 10,624,326	1928 \$2,488,236 1,864,024	1927 · \$2,601,366 1,915,685	1928 \$34,742,6 <i>5</i> 6 24,900,189	1927 \$35,095,876 25,132,333
Net revenue, railway oper Net revenue, auxiliary oper		\$261,411	\$141,979	\$177,361		\$5,565,415	\$624,212	\$685,681	\$9,842,467	\$9,963,543
Taxes	•••••	85,716	29,356	37,684		1,593,143	131,271	131,882	1,721,678	1,864,136
Operating income Non-operating income		\$175,695	\$112,623	\$139,677	\$3,821,102 150,823	\$3,972,271 159,230	\$419,940 11,009	\$553,799 19,190	\$8,120,789 100,491	\$8,099,407 97,534
Gross income	\$225,783 347,548	\$175,695 347,548	\$112,623 68,561	\$139,677 68,832		\$4,131,502 3,449,315	\$503,950 561,279	\$572,989 556,351	\$8,221,280 8,181,229 ⁸	\$8,196,941 97,974,126
Net income Operating ratio, per cent		\$171,853 80.0	\$44,062 82.7	\$70,845 80.7		\$682,187 65.6	\$57,329 74 .9	\$16,638 73.7	\$40,051 71.7	\$222,815 71.6
	Eastern Ma. St. Boston 1928	Ry.	Holyoke S Holyoke		Union Stree New Bedfo		Berkshire Railw Pittsfield 1928	ay	Springfield Springfie 1928	
Railway operating revenue Railway operating expenses	\$9,005,759 6,714,404	\$9,343,196 7,272,782	\$759,104 652,234	\$820,730 736,001	\$1,286,624 1,165,964	\$1,493,337 1,255,327	\$739,215 610,286	\$798,696 749,780	\$2,789,846 2,197,844	\$2,891,431 2,414,846
Net revenue railway oper	\$2,291,355	\$2,060,414	\$106,870	\$84,729	\$120,660	\$238,010	\$128,929	\$48,916	\$592,002	\$476,585
Net revenue, auxiliary oper Taxes	364,759	358,894	14,134	17,853	58,713	74,689	30,434	31,022	31,330	57,611
Operating income Non-operating income		\$1,601,520 282,238	\$92,736 24,120	\$66,876 10,863		\$163,321 1,370	\$98,495 1,857	\$17,894 2,240	\$560,672 6,348	\$418,974 15,116
Gross income	\$2,168,956 1,176,167	\$1,993,758 1,221,698	\$116,856 83,313	\$77,739 82,833	\$63,198 12,465	\$164,691 14,252	\$100,352 296,324	\$20,134 313,569	\$567,020 284,916	\$434,090 242,739
Net lucome Operating ratio, per cent	\$992,789 74.6	\$772,060 77.9	\$33,543 85.9	\$5,093 89.7	\$50,733 90,6	\$150,438 84.1	\$195,972 82.6	\$293,435 93.9	\$282,104 78.8	\$191,350 83,6

Italio figures indicate deficit or entries opposite the general account.

Includes taxes.
Taxes and other charges.

Includes rent of leased roads and guaranteed dividends, \$3,145,-

726. Includes rent of leased roads and guaranteed dividends, \$3,152,-

permit comparisons. The most of these can be presented in standard form. They represent a total gross revenue from railway operation in 1928 amounting, in round figures, to \$730,000,000. This is between two-thirds and three-quarters of the total business done by the electric railway industry. Of the 80 properties, 21 had a gross revenue for the year of more than \$10,000,000, and 18 had a gross revenue of less than \$1,000,000. The remaining 41 were between the limits of \$1,000,000 and \$10,-000,000 gross. The sizes of the companies are thus typical, and show what can be expected in the range of small, medium, and large properties.

Results of operation naturally vary over a wide range. In general the operating ratios of the smaller companies averaged higher than those in the medium-sized and large groups, although some of the small properties were run at comparatively small cost. The operating ratios for the greatest number of companies fell in the range between 70 and 80 per cent, there being 32 in this classification. The largest companies which had operating ratios below 70 are the United Railways & Electric Company of Baltimore, the Brooklyn-Manhattan Transit Corporation, the Interborough Rapid Transit Company and the Philadelphia Rapid Transit Company. All of these except the first have extensive subway and elevated systems, on which the fixed charges are far greater than for surface lines.

In the group of companies which had gross revenues in 1928 between \$1,000,000 and \$10,000,000, the companies whose operating ratios were below 70 per cent are the Denver Tramway Corporation, the East St. Louis & Suburban Railway, the Grand Rapids Railroad, the New York, Westchester & Boston Railway and the Honolulu Rapid Transit Company. The Westchester is a highspeed rapid transit line and the others are street railways. Labor conditions undoubtedly had much to do with the good showing in Honolulu. In the class of small companies, the Beaver Valley Traction Company and the Galveston-Houston Electric Railway operated at less than 70 per cent. Both are interurban lines, although the former, running through an intensely developed industrial district, has little to differentiate it from a city line. Eleven of the companies did not separate taxes in their financial statements, so that the operating ratio could not be computed for them. The range of operating ratios for all of the other companies is given in Table I.

Comparisons between results in 1928 and in 1927 indicate the progress being made in improving the financial status of the properties. The total revenues of the entire group were almost identical in the two years, there

Table IV (Continued)—Condensed Financial Reports of Electric Railway Properties, 1927-1928

	St.	Consolidated Ry. er, Mass. 1927	St. I	ment of Rys. ¹⁰ t, Mich.	Rali	Rapids froad pids, Mich.	Tracti	Superior on Co. , Minn.	Trans	ty Rapid lt Co. lls, Minn.
Railway operating revenue Railway operating expenses	\$3,116,623			\$23,507,972	\$1,574,171 957,625	\$1,675,352 1,005,643	\$1,873,330 1,535,169	\$1,965,489 1,570,441		\$13,425,643 9,959,972
Net revenue, railway oper Net revenue, auxiliary oper Taxes	\$672,767	\$450,704 85,980	\$5,384,678 783,013		\$616,546 133,617	\$669,709 133,496	\$338,160 153,561	\$395,047 156,659	\$3,054,801 1,098,849	\$3,465,671 1,254,793
Operating income Non-operating income	\$598,483 21,831	\$364,723 25,066	\$4,601,665 245,586		\$482,929	\$536,213	\$184,599 33, 7 94	\$238,388 38, 7 23	\$1,955,952 99,281	\$2,210,878 63,930
Gross income Deductions from gross income		\$389,789 387,881	\$4,847,251 4,821,781	\$5,023,851 5,020,39 7 ¹²	\$482,929 240,915	\$536,213	\$218,393 169,171	\$277,112 169,446	\$2,055,233 1,221,643	\$2,274,808 1,002,208
Net income Operating ratio, per cent		\$1,908 85.9	\$25,470 78,2	\$3,454 76.5	\$242,014 60.7	60.0	\$49,222 82.0	\$107,645 80.0	\$833,590 76.6	\$1,272,600 74.2
	Kansas City Public Service Co. Kansas City, Mo. 1928 1927		Public S	Louis ervice Co. uis, Mo. 1927 ¹⁵	Bluffs	Omaha & Council Bluffs St. Ry. Omaha, Neb. 1928		Public Service Co-ord. Transport. 16 Newark, N. J. 1928 1927		onal Ry. , N. Y.
Railway operating revenue Railway operating expenses	\$8,490,282	\$9,351,456 7,756,601 ¹	\$19,862,058 15,080,238		\$3,217,383 2,331,946	\$3,352,916 2,119,625		\$35,369,607 27,083,918	1928 \$11,116,653 8,336,905	\$11,192,908 8,853,657
Net revenue, railway oper Net revenue, auxiliary oper Taxes	\$2,247,812 120,828 ¹⁴ 505,530	\$1,594,855	\$4,781,820 1,889,825	\$4,235,051 1,851,139	\$885,437 441,118 377,197	\$1,233,291 366,927 548,147	\$9,226,292 3,031,718	\$8,285,689 3,087,839	\$2,779,748 749,918	\$2,339,251 780,140
Operating income Non-operating income	\$1,621,456	\$1,594,855 1 7, 859	\$2,891,995	\$2,383,912	\$949,358 39,937	\$1,152,061	\$6,194,574 207,831	\$5,197,850 227,880	\$2,029,830 56,913	\$1,459,111 50,138
Gross income Deductions from gross income	\$1,621,456 875,973	\$1,612,714 758,174	\$2,891,995 1,919,800	\$2,383,912 2,492,104	\$989,296 787,812	\$1,152,061 852,673	\$6,402,405 5,910,003	\$5,425,730 5,466,535	\$2,086,743 1,352,998	\$1,509,249 1,440,341
Net income Operating ratio, per cent	\$745,452 73.6	\$854,540	\$972,195 75.9	\$108,192 78.3	\$201,483 72.6	\$299,388 63.3	\$492,402 75,7	\$40,805 76.6	\$733,745 75.0	\$68,908 79.1
	Brookly Rails New Yor 1928 ¹⁷	road	'		Hudson & Manhattan R.R. New York, N. Y.		Interborough Rapid Transit Co. New York, N. Y. 192817 192717		New York New Yor 1928	k, N. Y.
Railway operating revenue Railway operating expenses	\$5,725,093	\$5,765,300 4,942,424 ¹	\$24,135,351 15,710,730	1927 ¹⁷ \$23,617,381 15,378,210	1928 \$12,388,927 6,425,643 ¹	1927 \$12,549,897 6,384,451 ¹	\$33,662,344 21,018,119	\$32,764,556 19,249,050	\$6,550,683 5,215,648	1927 \$6,907,920 5,421,255
Net revenue, railway oper Net revenue, auxiliary oper Taxes			\$8,424,621 1,652,834	\$8,239,170 1,646 462			\$12,580,225	\$13,515,505 1,798,633	\$1,335,035 466,452	\$1,486,665 478,191
Operating income Non-operating income	\$758,839	\$822,876	\$6,771,786 491,559	\$6,592,708 508,320	\$5,963,284	\$6,165,446	\$11,381,130	\$11,716,872	\$868,583 130,987	\$1,008,475 102,923
Gross income Deductions from gross income	\$758,839 249,464	\$822,876 264,495	\$7,263,345 4,157,203	\$7,101,028 3,977,722	\$5,963,284 4,022,226	\$6,165,446 4,027,564	10,805,530	10,802,012	\$999,570 872,768	\$1,111,398 982,613
Net income Operating ratio, per cent	\$509,475	\$558,381	\$3,106,141 65.1	\$3,123,306 65,1	\$1,941,057	\$2,137,882	\$575,600 62.6	\$896,860 58.7	\$126,784 79.6	\$128,785 78.5
	Third Ave Syst New Yor 1928 ¹⁷	em	N. Y., Wes Bosto New Yor 1928		New York Rocheste		Stark F Rails Alliance 1928	way	Cincinna Raile Cincina 1928	vay
Railway operating revenue Railway operating expenses	\$7,791,188 5,999,131	\$7,753,665 5,953,306	\$2,390,399 1,622,858	\$2,151,428 1,498,972	\$9,658,535 6,945,011	\$9,879,150 7,058,067	\$328,631 297,532	\$323,475 312,751	\$8,819,116 6,320,173	\$8,700,257 6,332,429
Net revenue, railway oper Net revenue, auxiliary oper		\$1,800,358	\$767,541	\$652,456	\$2,713,523	\$2,821,083	\$31,099	\$10,724	\$2,498,943	\$2,367,828
Operating income	\$1,236,888	\$1,239,957	\$527,868	\$423,305	\$2,129,791	\$2,224,517	\$20,439		\$1,751,625	\$1,596,459
Non-operating income Gross income	\$1,351,260	\$1,343,886	\$540,522	\$438,492	\$2,161,456	\$2,347,472	\$25,635		\$1,779,174	\$1,644,480
Net income	\$155 <u>,311</u>	\$33 <u>,688</u>	\$1,908, <u>4</u> 28	\$1,864,999	\$659,556	\$839,090	\$42,970		1,764,381	\$20,339
Operating ratio, per cent	77.0	76.7	67.9 Cincinnati,		71.8 Comm	71.5 unity	90.6 Portland	96. 8 d Elec.	71.8 Lehigh	
	Cleveland Cleveland 1928		& Dayton Dayton 1928		Tractio Toledo, 1928	n Co. Ohlo 1927	Power Portland 1928	Ore. 18	Transi Allentow 1928	t Co. n, Pa. 1927
Railway operating revenue Railway operating expenses	\$18,272,040 15,065,214	\$18,706,290 14,806,631	\$1,151,905 951,496†	\$1,065,056 934,359†	\$3,670,337 2,565,163	\$3,408,387 2,615,183	\$4,523,475 3,789,850	\$4,630,431 3,729,749	\$4,314,937 3 199,996 ¹	\$4,590,261 -3,367,094
Net revenue, railway oper Net revenue, auxiliary oper Taxes	\$3,206,826 1,261,527	\$3,899,659 1,388,602			\$1,105,174 230,356	\$793,204 209,524	\$733,625 91,496 379,218	\$900,683 94,645 358,045		
Operating income Non-operating income	\$1,945,299 275,708	\$2,511,057 214,363	\$200,409 19,379	\$130,697 2,271	\$874,818 20,734	\$583,680 23,396	\$262,909	\$447,992	\$1,114,941 143,610	\$1,223,167 128,934
Gross income	\$2,221,00 7 2,530,953	\$2,725,420 2,138,156	\$219,789 144,249	\$132,968 109,447	\$895,549 69 7 ,443	\$607,074 881,182			\$1,258,551 834,176	\$1,352,100 832,054
Net income Operating ratio, per cent	\$309,946 82.5	\$587,264 79.2	\$75,539	\$23,521	\$198,106 70.0	\$274,108 76 .8	83.8	80.5	\$424,375	\$520,047

Italio figures indicate deficit or entries opposite the general account.

'Includes taxes.

'As computed by the city's auditor.

'Includes \$2,579,119 sinking fund for bonds and purchase contract.

'Includes \$2,600,223 sinking fund for bonds and purchase contract. tract.

¹³Present company formed May, 1927. ¹⁴Bus revenue, \$540,006; bus operating expenses, \$660,834. ¹⁵Operated by receiver to Nov. 30, 1927. ¹⁶Includes Public Service Railroad and other affiliated companies. ¹⁷Six months ended Dec. 31. ¹⁸Railway division only.

Table IV (Continued)—Condensed Financial Reports of Electric Railway Properties, 1927-1928

	Co	ey Tracilon 0,19 hton, Pa. 1927	Transl	ohla Rapid t System Iphia, Pa. 1927		h Rallways rgh, Pa.	Scrani	ı Rallway on, Pa.	Rail Provide	Electric ways nce, R. I.
Railway operating revenue Railway operating expenses	\$538,205	\$552,950	\$55,835,521 38,935,149		\$20,576,466 15,627,144		1928 \$1,976,940 1,382,279	1927 \$2,092,046 1,510,837 ¹	1928 \$7,423,475 6,088,608	1927 \$7,876,423 6,388,099
Net revenue, railway oper Net revenue, auxiliary oper Taxes	_ 143	\$144,425 664 10,404	\$16,900,372 3,402,066	\$16,913,487 3,306,762	\$4,949,322 1,279 569,624	\$5,053,632 13,850 608,137	\$594,660 45,757		\$1,334,867 361,850	\$1,488,324 396,383
Operating income Non-operating income		133,357 2,569	13,498,306 1,390,208	13,606,724 980,917	4,380,977 117,339	4,459,346 165,658	548,903 4,291	581,209	973,017 86,559	1,091,941
Gross income		\$135,926 145,251	\$14,888,514 11,361,425	\$14,587,642 10,805,457	\$4,498,316 4,487,830	\$4,625,004 4,583,721	\$553,194 491,145	\$581,209 520,237	\$1,059,576 626,374	\$1,175,500 664,531
Net income Operating ratio, per cent	\$2,504 68.6	\$9,325 73.8	\$3,527,089 69.7	\$3,782,185 70.3	\$10,486 75,9	\$41,283 76.3	\$62,049 70.0	\$60,972	\$433,202 82.0	\$510,969 81,1
		tric Railway , Texas 1927		on El. Ry. n, Texas 1927		Elec. R.R. City, Utah 1927	Pac. Nor'we Seattle 1928	st Trac. Co. Wash. 1927	Seattle Mu Seattle, 1928	
Railway operating revenue Railway operating expenses		\$1,865,000 11,189,380 ¹	\$643,800 373,360	\$696,860 404,881	\$559,796 438,624	\$559,230 444,711	\$881,076 736,776	\$878,482 688,830	\$5,627,099 4,793,341 ₍	\$5,703,873 4,765,846
Net revenue, railway oper Net revenue, auxiliary oper Taxes			\$270,440 31,768	\$291,978 30,684	\$121,171	\$114,518	\$144,300 51,644	\$189,652 45,420	\$833,758 24,937	\$938,027 26,598
Operating income Non-operating income	\$633,762 4,696	\$675,620 2,063	\$238,671	\$261,293	\$84,106 18,017		\$92,654	\$144,231		
Gross income	\$638,459 588,809	\$677,683 506,532	\$238,671 269,808	\$261,293 265,759	\$102,213 92,082		\$92,654 155,255	\$144,231 170,357	\$858,695 647,083	\$964,625 698,104
Net income	\$49,650	\$171,151	\$31,138 58.0	\$4,466 58,1	\$10,131 78:3	\$6,642 79.5	\$62,601 83.6	\$26,126 78.5	\$211,612 85.2	\$266,521 83.5
	Spokane U Spokane		London S London		Montreal 'Montrea		Havana Ele Havana		Hono. Rap. Honolulu	
F.	1928	1927	1928	1927	1928	1927	1928	1927	1928	1927
Itailway operating revenue Itailway operating expenses	\$1,301,455 1,350,872	\$1,301,971 1,327,981	\$618,961 519,690	\$638,519 531,598	\$14,938,678 11,503,314 ¹	\$13,728,153 9,296,067 ¹	\$5,415,175 4,494,473 ¹	\$6,020,680 4,814,609 ¹	\$1,089,963 630,341	\$1,019,245 626,453
Net revenue, railway oper	\$49,417	\$26,010	\$99,271	\$106,921					\$459,621	\$392,792
Net revenue, auxiliary oper Taxes	64,231	61,738						• • • • • • • • • • • • • • • • • • • •	147,282	123,801
Operating income	\$113,648	\$87,748			\$3,435,364	\$4,432,086	\$920,702 39,171	\$1,206,071 52,225	\$312,340	\$268,991
Gross income. I deductions from gross income	123,634	123,634	\$99,271 92,7891	\$106,921 93,8721	2,935,364	2,879,141	\$959,873 643,951	\$1,258,296 643,893	\$312,340 135,199	\$268,991 84,480
Net income	\$237,382 103.8	\$211,481 102.0	\$6,482 84.0	\$13,048 83.3	\$500,000 ²¹	\$1,552,94521	\$315,922	\$614,403	\$177,141 57.8	\$184,511 61.5

Italic figures indicate deficit or entries opposite the general

Includes taxes.

¹⁹Includes Pittsburgh & Beaver Street Railway.
 ²⁰As given in income statement.
 ²¹Of this amount, \$500,000 is paid to the city of Montreal when

being a drop of 0.1 per cent in 1928. This showing for the 80 properties is probably more favorable than the total for the entire industry, as most of the large city properties are included in the statistics published in this article. However, comparisons of the results for the individual properties show that nearly half of them increased their net last year. Reference to Table II shows that while only 22 companies reported gains in gross revenue, 47 of them were able to reduce operating expenses. As a result 31 of them had a gain of net revenue for the year.

It is worthy of note that in the classification of small companies, the relative improvement in operation was the greatest, as ten of them were able to show an increase in net as against seven showing a decrease. In the middle-sized group, fifteen companies gained net, while eighteen showed less net at the end of the year. The large companies made, relatively, the poorest showing, as only six of them increased their net revenue, although nine showed greater gross receipts than in 1927.

According to the figures available, 24 companies in the list paid dividends on all or a portion of the capital stock during 1928. The companies doing so are listed in Table III. Since some of the companies pay inter-company dividends to holding companies that are not reported, it is possible that other dividends may have been declared. In a few instances the dividends are virtually

guaranteed as part of a service-at-cost plan. Examples of this are the Boston Elevated Railway, the Cincinnati Street Railway and the Cleveland Railway.

British Tramways Improve Position

NCREASED revenue and decreased operating expenses, as shown in the annual report of the Ministry of Transport, have resulted in a material improvement in the financial condition of British Tramways. There was a slight reduction in the route-mileage, due to the substitution of trackless trolleys and buses. average fare per passenger decreased slightly, but the number of passengers carried increased. figures for all tramways in Great Britain are given in the accompanying table.

SUMMARY OF BRITISH	TRAMWAY	OPERATION	s
	Last Year	Previous Year	Net Change
Number of tramway systems	233	235	2*
Miles of route			40*
Gross receipts	£27,751,504	£26,916,535	£834,969
Operating expenses	£21,943,147	£22,128,461	£185.314*
Average fare	1.39d.	1.42d.	0.03d.*
Note:-These figures are based on re	eturns of 66 r	rivately-owned	tramways
for the year ended Dec. 31, 1927, and 167 March 31, 1928.	municipal tra	mways for the	year ended

Mass Transportation Service



ASUAL observation of transportation systems in European cities reveals the fact that the electric railway is still very much alive, no matter to what degree it may have been maltreated, and that nearly everywhere it is still considered the backbone of mass transportation. While it must be admitted that bus service is in-

creasing rapidly all over Europe, the general feeling of the public is that electric railways are preferable, because of their greater cleanliness and less noise, and also because of the stability of this form of transportation, assured by the presence of track and overhead.

Considering the rolling stock and operating improvements which have been made in America in the last two decades, European city transit as a whole is fairly obsolete. From a technical standpoint, it offers extensive possibilities for modernization. One of the favorite theories of European management seems to be that paint represents the utmost in progressiveness and efficiency. The writer does not hold any brief against a clean and well-painted car, but when painting is used simply to camouflage an old piece of rolling stock, which should have been consigned to the scrap heap long ago, he feels that it is a somewhat far-fetched application of the

MARQUIS CUSANI recently returned from an extended trip through Germany, The Netherlands, Denmark, Norway, Sweden and Finland. This article tells of his observations of the local transportation situation in these countries, supplemented by previous observations in other European countries. The author's familiarity with American practice enables him to present these views in an extremely interesting manner.—Editor.

"Save-the-surface and you-save-all" slogan. It is a mistake in most cases to "save the surface" at all.

The habit of trying to reclaim obsolete equipment has brought about a condition whereby, in the present day, cars of the early Vandepoele period are found in service as sound as if they had been built a year ago. Not one original part is

to be found in them, and the replacements, without improvement, have brought about total reconstruction at a cost which might have paid for better and more modern cars, had the earlier ones been scrapped sooner.

In Continental Europe only a very few urban electric railways have been willing to profit from American experience. In fact, the only ones which have come to the writer's notice are located as far apart as Spain, Italy and Finland. Everywhere else improvements seem to have been made principally in minor details of car construction, in the development of mercury-arc rectifier substations and in the design of track, carhouses and shops. The idea of adopting radical changes in operating methods and introducing greater safety and speed seems to have found its way only in Milan, Italy, where the adoption of the American "pay-as-you-pass" system is making great strides. Other European managements

Expanding in Europe

Electric railways are much alive despite increasing use of buses. Enormous possibilities for modernization exist in most cities. Single truck cars and trailers continue to be used widely, although large double-truck units are being introduced on some systems. Numerous improvements in electrical and mechanical equipment are being tried



seem to be contented at present with elaborate traffic signs, route maps and freakish car designs, which either do not come out of the experimental stage, or if they ever do, prove that they should never have done so.

The economic and monetary disturbances caused by the World War are generally considered responsible for this state of affairs, but to the technical man it appears very clearly that it is due rather to the lack of technical enterprise, a peculiar condition which does not seem to have any particular connection with the great struggle. The European public does not as yet consider the private automobile as a common household accessory, and still clings to tramways, rapid transit and buses as its principal means of transportation. It is, therefore, easily understood why managements have lacked the incentive to follow any definite and clearly-defined improvement policy, and have given more attention to easily solved particulars than to drastic redesigning along the lines which had already been proved right by American practice.

A large number of European systems are either municipally owned or operated by corporations whose shares are mainly held by city or state governments. Most private companies are nearing the end of their franchise terms and do not feel like making any unnecessary capital expenditures. Traffic is increasing generally, though slowly. In the case of public-owned utilities, competition is carefully "nipped in the bud," and the public compelled to avail itself of the existing carriers.

A slightly modernized version of the "public-be-damned" policy is still in full swing, a number of petty improvements being considered as of sufficient value to satisfy the riders fully.

There is a general tendency to speed up schedules in greater and medium-sized cities through rerouting, the adoption of more powerful motors, the use of more appropriate gear ratios and the introduction of better brakes. Cars in some of the German cities have a high accelerating rate, which often is made useless in the congested areas by the existence of old-fashioned automobiles and taxicabs which slow up all traffic. In the medium-sized cities, horse-drawn trucks often impede progress, while in some parts of Northern Europe bicycles, during the warmer months, are a serious nuisance. In Copenhagen, Denmark, for instance, there are more than 450,000 bicycles for a total population of approximately 900,000.

The growth of the automobile has brought about the same traffic problem that all American cities are facing, although to a somewhat lesser degree. Barring London and other British cities where traffic regulation has been developed from long experience into a simple and understandable system of signals, the vehicle driver in Continental Europe is always facing something new, not only when going to another city, but when coming back to his own after a few days absence. Frequent "improvements" in signals, traffic signs and policemen's gesticulations leave him in a quandary as to the right thing to do.



Milan, Italy, is one of the few Continental cities that have profited from American practice. The new pay-as-you-enter cars are of distinctly modern design and have many American features



Interior view of one of the new Milan cars. The seating arrangement and the front-entrance, center-exit plan are proving popular with the public

In some instances it is even worse, for certain gestures of the German *Schupo* (*Schutzpolizei*) have a meaning exactly contrary to the same gestures made by the *Vigile* of Milan.

The only city where traffic signals are almost similar to those used in America is Amsterdam, Holland, where an extensive use is made of the "Go" and "Stop" semaphore, and where policemen are dressed almost like American officers. When one considers the narrowness and the complicated layout of the many streets, the heavy traffic, the omnipresence of bicycles and the extreme reluctance of Dutch automobilists to shift from high gear, one must pay a high tribute to the efficiency of the Amsterdam traffic police.

TRAIN OPERATION VERY GENERAL

It can be stated without fear of error that every tramway service in Continental Europe is making extensive use of trailers. It is difficult to understand why the unsoundness of such a policy has not been apparent to the companies. Trailers were adopted when it was found that the small two-axle motor cars were insufficient to cope with the increasing traffic. The step was considered as very economical inasmuch as a new trailer required only one additional conductor instead of two new trainmen for a motor car. The thought of discarding the old car in favor of a new double-truck unit seems to have been considered very seldom. A far-fetched justification may be found in the fact that the complicated system of fare zones and tickets being used in many cities was already putting a strain on conductors of small-sized cars. The writer well remembers having seen doubledeckers in Rome, Italy, of smaller capacity than those operated by the London County Council and served by two conductors, who were punching away to their heart's content duplex tickets looking like Pythagorean tables. Some German cities, like Cologne, Dresden and Karlsruhe, have brought the idea one step further, and have added a second trailer and, therefore, a third conductor. It is interesting, indeed, to stand in the Marktplatz of the very quiet city of Karlsruhe and see three-car trains, passing by in the slack hours, carrying two or three passengers and a crew of four men. The interest increases a hundred-fold when it is discovered that the headway is such that even on the very long and straight thoroughfares of this city, the "one-car-always-in-sight" theory is relegated to the discard.

SINGLE-TRUCK CARS PREDOMINATE ON THE CONTINENT

Barring the British Isles, where the double-deckers are still holding sway and maximum traction trucks are extensively used, the single-truck car is still predominant in European city service. The only exceptions to this rule seem to be Barcelona, Spain; Munich, Germany, which is still building double-truck city cars; Rome, Italy, where all new cars are double-truck; and Milan, Italy, where by the end of 1929, 500 Peter Witt cars will be in service, to be followed by many more in 1930. Berlin, which was one of the carliest cities to use double-truck cars, has gone over to units made up of two single-truck, jumper-cable cars, somewhat similar in arrangement to the older types, now discarded, of the New South Wales Tramways in Sydney, Australia. A few all-steel, center-entrance, double-truck trailers, with inside jour-



In Vienna, as in many other Continental cities, a single-truck motor car with trailer is used instead of one larger double-truck car

nal trucks, have appeared in the German capital, but it is still too early to draw any conclusions about their

performance.

To provide sufficient stability on a short wheelbase, it is necessary to have a very heavy weight of the truck and underframe, and it is not unusual to find single-truck cars, seating eighteen to twenty passengers, weighing as much as 12.5 metric tons (about 27,500 lb.), and trailers of the same size weighing about half as much. It is interesting to note that the standard car used previously in Milan, having a capacity of 24 seats and 26 standees, weighs approximately 12.8 metric tons, while the new all-steel, four-motor pay-pass cars, having a capacity of 47 seats and 54 standees, weigh about 13.5 metric tons, a difference of about 0.7 metric tons

(1,540 lb.) for a car accommodating twice as many pas-

sengers.

Fixed-point fare collection is almost exclusively limited to a few Italian operations and to a number of Dutch cities running one-man cars. The Lombard Electric Traction Company, of Milan, operates all of its suburban lines with double-truck, paywithin, rear-entrance, frontexit cars. The Milan Municipal Tramways is operating a number of doubletruck, pay-pass cars with Ohmer registers and Johnson fare boxes, and is adding to its fleet about 50 new cars each month.

One-man operation is in effect in a number of German, Dutch and Italian cities, and varies in completeness from Bolzano and Merano, Italy, where cars with semi-enclosed platforms are operated by the motorman alone, who takes in fares and issues tickets, to the all-electric one-man car of the

1-cent line around the Central Station at Amsterdam, where the latest type of fare box (bus as they call it in Dutch) is used. All the one-man cars in Holland (Arnhem, Haarlem, Amsterdam, Utrecht. etc.) have controlled doors and steps. The cars of Arnhem have a manual control which extends to the rear door and takes

the place of the American treadle.

Barring the Italian cities and the Dutch operations already mentioned, the only city using door and step control rather extensively is Helsingfors, Finland. This city has a number of single-truck motor cars and trailers of Brill manufacture, delivered about the close of the war, having manually-controlled folding doors. All the more recent cars, built along the same general lines in Sweden and Germany, have been equipped with the same apparatus, the trailers being supplied with National Pneumatic door engines. A peculiar feature of the Helsingfors operation is that it employs women conductors, a practice which has disappeared from almost all other European tramways. The pay-within principle

could be used easily on these cars, but the company still resorts to hand collection with tickets.

Although not meant for pay-as-you-enter operation, a number of cars in Zurich. Amsterdam, The Hague, and Stockholm have a separate entrance and exit on the rear platform, and another exit on the front platform, under the motorman's control, an arrangement similar to that of the pre-war Montreal cars.

ALL-STEEL CONSTRUCTION GAINING FAVOR

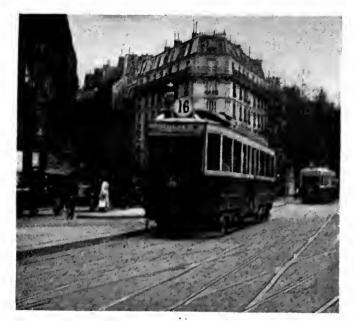
All-steel, girder-plate car construction, strictly following American practice, can be found at present only in Barcelona, Spain, where much pioneering work has been done; in and around Milan, Italy, both on the Lombard Electric and on the Municipal lines; and in Helsingfors,



Strect scene in Berlin, showing traffic signal tower, street cars, a double-deck bus and bicycles

Finland, where all-steel cars built by the General Swedish Electric Manufacturing Company, of Västeras, Sweden, and by the "Nordwaggon," of Bremen, Germany, are in service. Many German companies are operating all-steel cars of a somewhat heavier and more complicated design, built by such firms as Van der Zypen & Charlier, Linke-Hoffman-Busch, "HAWA" and Saxon Car Works. The all-steel type of construction has been pushed much further on trunk line railroads where there is more interest in the anti-telescoping feature.

Pressed-steel side frames, both for single and double trucks, are used very extensively. In some places, especially in single trucks, deep channels, bent at the pedestals to clear the journal boxes, are substituted. The fashion of forged sideframe trucks of American pattern seems to be somewhat declining. However, it is interesting to note that about 200 single trucks of the Copenhagen Tramways and 1,035 of the Milan Tramways are of the single-piece, cast-steel type, designed by the Commonwealth Steel Company, of St. Louis.



In Paris the center slot trackage has been extended recently, but underground current collection on the Continent is still limited to this city, Budapest and Brussels

Some years ago it looked as though the Cardan drive were going to take Europe by storm, and experiments in France, Germany, Belgium and Switzerland were carefully watched. Because most of these were combinations of common rolling stock and automotive designs. they were not satisfactory enough to cause large-scale imitation. A casual observer looking at the cars of the Paris municipal transportation system, by far the largest user of Cardan-drive street cars, will notice that single trucks, which were sturdily built for inside-hung motors and very long center-entrance bodies, are now seriously bent down at the ends. A closer examination will disclose the fact that this is caused by the Cardandrive motors being hung at the extreme ends of the truck frames. The German cars, being mostly of new construction, have not experienced this trouble. However, it does not appear that many cities have followed in the wake of these properties.

Serious attention is being paid by a number of lines to the adoption of ball and roller bearings, not only for armature shafts but also for axle journals. The firms which, after long pioneering and research work, seem to have met with the most success are the Swedish Ballbearing works, the German Arms Company, the Fichtel & Sachs Company, of Germany, and the Villarperosa-RIV. Company, of Italy. The improvement in design, manufacture and materials of these bearings, brought about in the last few years by the expansion of the automotive industry, offer a guarantee that this will be a step in the right direction.

Although experiments are continually being made with new ideas on the electrical control of cars, none seems as yet to have come out of the experimental stage into widespread adoption. Companies using equipment of American type or following American designs have adopted remote control and line switches. Important installations of this kind are being made in Milan and in Rome. The refinements which are being adopted in America, such as cabinet control, have not been given serious consideration as yet. Safety car control, of the Bergmann all-electric type, has been adopted only on a fleet of one-man cars in Amsterdam, the other Con-

tinental one-man cars being more or less in the "Toonerville-trolley" class.

Until now the combination of electric and solenoid braking for two-car trains has been confined to Germany and other countries of Northern Europe, while Latin Europe has leaned more toward the air brake. It is interesting to note that for a number of years Italy has required by law that air brakes be installed in all new or fully-rebuilt passenger rolling stock of both steam and electric railways. The widespread use of air brakes on the latest types of heavy motor buses in Germany has caused a revival of their use in street railway work. Basel, Switzerland, is installing air brakes on cars which formerly were equipped with solenoid brakes, and Genoa, Italy, has already discarded all its solenoid brakes in favor of air. A number of Belgian and Italian cars have been equipped with various types of regenerative braking. At the last International Congress in Rome regenerative brakes were discussed extensively, the consensus of opinion being that, although these designs are worked out well and give satisfactory performance, the brakes are not adapted to city service where fast schedules are to be maintained in the heavy traffic congestion. The Milan municipal lines, which in 1927-28 equipped a number of their newer cars with these brakes as an experiment, have adopted the Westinghouse variable load brake for the first lot of 502 double-truck cars which will be put in service in 1929.

A new magnetic brake, in which a solenoid by means of a piston, forces oil out of a compressing cylinder into a brake cylinder, was originated in Belgium and is being tested in various countries. Experiments have not lasted long enough to draw any definite conclusions.

CURRENT COLLECTING DEVICES

Underground current collection is still limited to the three original Continental installations, namely, Budapest, Hungary; Brussels, Belgium, and Paris. This last city, however, has extended very substantially its center slot trackage, trolley wires having been removed from all the central zone of the city. The Siemens bow collector, with the aluminum "U" section contact piece, seems to be losing favor. In many places it is claimed that the frequent sparking, which it occasions, greatly disturbs radio programs. In Arnhem, Holland, the local radio amateur league paid for the replacement of all the bow collectors of the city tramways to eliminate interference.

A pressed-steel shoe collector, originating in Budapest, is gaining widespread attention in many Central European



German manufacturers are taking the lead in the production of modern bus chassis and bodies. Six-wheelers, similar to this bus in Hamburg, are popular, although rather cumbersome for heavy traffic

properties, while the pantograph is being adopted on a number of new cars in Germany and on most of the cars in Sweden and Finland. This change seems to be prompted both by the rather low current-collecting capacity of the bow and to its instability against strong winds.

The wheel trolley is still holding its own. Very large cities, such as Berlin, Paris, Brussels, Copenhagen, Lyons and Milan, have not changed their current collectors, even in the face of heavy overhead and car reconstruction programs. A noteworthy example of a return to the wheel trolley is found in Turin, Italy. After the merger of the Turin Tramways Company, using the trolley, with the Municipal Tramways, using the bow collector, the latter management decided to equip all municipal cars with trolley poles and to discard bow collectors.

Eight Continental cities are served by more or less extensive rapid transit systems. Of these the largest by far is the Metropolitan-North-South network in Paris. A heavy amount of new construction work is under way in the French capital, the subway lines having been authorized to extend beyond the octroi (city customs) line. The next in importance is the Berlin Underground where extensions to five lines are under way. The other six rapid transit services are of a much lesser size: Madrid, Hamburg, Barcelona, Naples and Oslo. The latter two are to be considered more as underground stubs serving as terminals of outside lines than as city subways.

Two steam railroad electrifications of suburban lines of great interest are the Berlin belt and suburban lines of the State Railways, which form a very up-to-date system of elevated and open-cut, third-rail rapid transit, equipped with modern all-steel, multiple-unit cars, and the suburban electrification of the French State Railways which operate out of the Saint Lazare Station in Paris.

A good example of excellent service to the public of large-sized cities is given by the high-speed interurban electrification of the Dutch State Railways, connecting the cities of Amsterdam, Haarlem, Leyden, The Hague, Delft and Rotterdam. Frequent, fast and comfortable trains are operated with a high degree of safety and compare favorably with such American services as those of the Long Island Railroad and the Philadelphia suburban system of the Pennsylvania. To the writer's knowledge, the Amsterdam-Rotterdam is the only European interurban high-speed line where dining car service is regularly operated.

BUS OPERATIONS VARY WIDELY

A complete analysis of the motor bus operations in Europe would require a volume, the differences in vehicles and in operating methods being much greater than in North America. A lesson which can be learned from a cursory examination is that large city operations, while rather successfully meeting the traffic burdens imposed upon them, do not seem to be very successful business ventures. It is a common remark of transportation men that the motor buses of the two largest Con-

tinental cities have been merged with the surtace lines so that electric street cars can carry the burden of both.

From a technical standpoint it may be safely asserted that, at present, German manufacturers are ahead of all other Continental makers in the production of up-to-date chassis and bodies, although some of the latest sixwheelers seem to be rather cumbersome for heavy traffic. Steel bodies are almost universal, but serious thought is being given to light-weight alloys.

The double-decker is losing favor, the only large system which uses them being the "ABOAG" in Berlin. The Rome and Genoa municipal bus lines have completely discarded the double-decker in favor of larger but more flexible rear-entrance, front-exit single-deckers. Many of the latest motor buses are arranged for one-man operation and are equipped with folding doors. Air brakes are also common on the larger German units.



Pantographs are being used on new cars in a number of European cities. This is a modern interurban car of The Hague Street Railway Company at a resort near The Hague

In a few cities fleets of American buses are used: in Oslo, Norway, all buses operated by the Tramway and Omnibus Company are A.C.F.'s, equipped for one-man operation with Johnson electric fare boxes and registers. At the time of the writer's last visit, an A.C.F. Metropolitan Coach was being operated in experimental service. The Helsingfors (Finland) Tramway and Omnibus Company is operating a large fleet of Reo buses, while the Amsterdam municipal bus lines have a large number of Brockway omnibuses.

Jitney competition is practically unheard of on the Continent. The only example seems to be in Rotterdam, where the transways are operated by a private company using very obsolete, but neatly-painted, equipment, and where all sorts of vehicles are being used to compete with the electric railway. Old Ford model T's, French Latils and Renaults, Italian Lancias, German Büssings and even some defunct Holland Spijkers have compelled the Rotterdam Electric Railway Company to turn bus operator. The up-to-date and smartly-built Krupp buses, which it has put in service, do great credit to the company and help to dispel the bad impression left on the public by the obsolete rail rolling stock.

California Railway Men Study Ways to Increase Riding

PROBLEMS of increasing the traffic of the electric railway industry held the attention of 150 delegates who attended the annual meeting of the California Electric Railway Association in Los Angeles May 9-11. At the first day's meetings a symposium of papers was presented dealing with the many aspects of regaining patronage lost to the private automobile. George Baker Anderson, Los Angeles Railway, said that the public is willing to spend money freely for almost everything but complains about street car fares. chief problem of his property is coping with traffic congestion and endeavoring to increase average car speed. Among the factors tending to cause loss of patronage, according to A. W. Brohman, Market Street Railway of San Francisco, are: increasing use of the private automobile, lack of proper traffic regulations, popularity of community moving picture houses and shopping centers, demand for increased speed and greater comfort and increasing fares. His company has made notable progress in retaining the street car rider by providing more attractive cars with more comfortable seats. Lines with so-called comfort cars show the falling off less than others, and increased speed has improved revenue per car-hour. The average operating speed for city lines in San Francisco is now 10.5 m.p.h. It has been interesting to note that increased speed has not increased accidents. An employee training department is largely responsible for reducing labor turnover from 40 per cent in 1925 to 20 per cent in 1928.

"The traffic department is the sales department of a railway property," declared O. A. Smith, Pacific Electric Railway. "Sales methods must be applied and the product must be of such a quality that it will compete with the market. The private automobile is the chief competitor and it behooves railway operating men to study the situation and provide more comfortable seats and equipment and do everything to compete with the railway's competitor." On his property \$100,000 spent on reseating 50 interurban cars with soft leather seats has produced a favorable public reaction. Mr. Smith told of results of replacing some older 25-passenger buses with modern 41-passenger coaches on a crosstown line. Operating costs excluding taxes and interest were reduced from 25-26 cents per bus-mile to 20-21 cents per bus-mile, headway was increased from eight to ten minutes, yet patronage increased more than 15 per cent, all as a result of the new equipment. Average speed for the line is 11.2 m.p.h. and average revenue per passenger is $5\frac{1}{2}$ cents.

E. A. Simon, Westinghouse Electric & Manufacturing Company, pointed out the necessity of transportation agencies, traffic commissions and every civic agency making a serious study of the street problem and making a concerted effort to increase speed of every moving vehicle. The street railways will then benefit equally with all other users of the streets. In discussing equipment design he stated that the mechanical and engineering departments have had too much to say in the past about equipment and rolling stock. This he feels should be the province of the transportation department because it is this department that has the best idea of what is needed. At his suggestion a committee was appointed of three operating men and two engineers to

study California car needs and types of equipment looking toward establishment of a general standard that will meet the needs of a majority of the properties.

The second day was given over to meetings of the several committees of the association at which a number of interesting papers were presented and discussed. At a joint meeting of the purchase and stores committee and the engineering committee the subject of disposition of obsolete equipment came up for discussion. It was mutually agreed that the storekeeper and the engineering and operating departments must work more closely in deciding when and what to scrap in order to reduce the large and expensive stocks of obsolete equipment on most properties.

Middle Atlantic Equipment Men Meet at Wilmington

WITH the Delaware Electric Power Company acting as host a well-attended meeting of the Middle Atlantic States Association of Railway Equipment Men was held in Wilmington, May 15 and 16. At the first session, Walter S. Adams, designing engineer J. G. Brill Company, presented a paper on "New and Projected Developments," and discussed numerous features of the new Brill master unit cars, as well as ten cars recently put into service in Wilmington. Discussion was led by D. E. Frame, master mechanic, Delaware Electric Power Company. During the day, an opportunity was presented to inspect these units closely and ride in them.

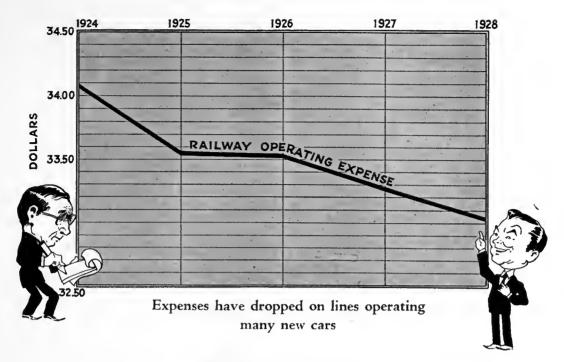
Another interesting paper was read by L. C. Carter, General Electric Company, reviewing recent developments in street railway equipment. The discussion was led by R. D. Voshall, Washington Railway & Electric Company. A. J. Manson, Westinghouse Electric & Manufacturing Company, also read a paper on developments in the electric railway industry. Mr. H. A. Leonhauser, assistant to the superintendent of equipment United Railways & Electric Company, Baltimore, discussed this paper at considerable length. The pros and cons of the gas-electric bus were also discussed and aroused much interest.

The concluding paper was presented by J. F. Craig, of the Westinghouse Traction Brake Company, in which the various requirements of efficient braking were thoroughly discussed. Mr. Craig explained in detail how certain difficulties should be overcome and emphasized the necessity of faster braking.

Thursday morning was given over to a discussion of questions which were submitted by members of the association previous to the meeting. Various solutions were suggested for the numerous problems considered. During the afternoon, a tour of inspection was made through the shops of the Delaware Electric Power Company.

The meeting was attended by approximately 30 members of the association. On Wednesday evening a dinner tendered by the Delaware Electric Power Company had an attendance of approximately 100.

Election of new officers resulted in the selection of W. H. McCarty, Capital Traction Company, Washington, D. C., as president; D. E. Frame, Delaware Electric Power Company as vice-president, and R. D. Voshall, Washington Railway & Electric Company, as secretary for the ensuing year. The next meeting will be held at Richmond. Va.. on Nov. 20 and 21.



New Cars

Reduce Operating Costs

on Many Properties

EDUCTION in operating costs on the properties included in Electric Railway Journal's survey of new car experience is clearly shown over a period of five years by the figures submitted by these companies. Totals were published in the May issue, showing that over a period of five years the operating expenses of the 41 companies for which complete figures were available dropped from 34.08 cents in 1924 to 33.02 cents in 1928. That such a result is not accidental or caused by some peculiar combination of circumstances is seen in the continual reduction year after year during this period.

Moreover, this reduction has been obtained on properties where

only a relatively small proportion of the cars have been replaced. In the seven years for which the purchases of new cars have been considered, only 5,514 have been bought, as contrasted with 17,488 required to give maximum service. This is 31.5 per cent of the total. Many of the companies have not made an attempt to

By
MORRIS BUCK

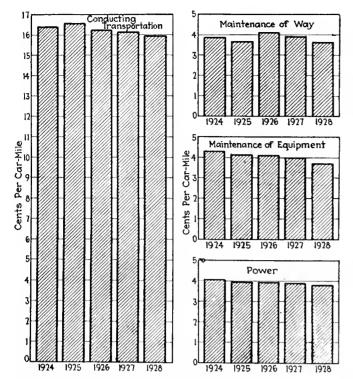
Engineering Editor Electric Railway Journal

In this, the second of three articles of a survey of properties which have substituted new cars for old, savings of great magnitude are shown. Way and Structures, Equipment, Power and Conducting Transportation expenses have all been substantially reduced during five-year period covered

segregate the cars on separate routes, so that the maximum advantages of the new equipment have not been evident. What is more, the time over which the purchases have extended indicates that at the same rate the time required to replace all the old cars would correspond to an average life of the cars on these properties of about 22 years—much longer than the present need for improvement to keep pace with current developments would dictate.

In this article is given an analysis of the major operating accounts for the 41 properties. A comparison with the remainder of the industry, such as that made for the total revenues and expenses, is not possible, since not all

of the companies reporting to the American Electric Railway Association give complete statistics in form for such analysis. Results on the 41 properties over the period 1924-1928, however, show that certain trends are taking place on the properties that have made replacement of obsolete rolling stock a definite objective.



Expenses of the 41 properties have been reduced in the principal operating accounts which could be influenced by new cars, over the five-year period

Few properties separate their maintenance costs for the new cars, so that it is impossible to determine their effect apart from the general reduction in the operating account. The table shows that the total expense for maintenance of equipment has gone down from \$26,845,-195 in 1924 to \$23,723,728 in 1928. The saving is \$3,121,467, or 11.6 per cent. On a car-mile basis the reduction has been from 4.29 cents to 3.75 cents, or 12.6 per cent. This higher proportional reduction follows from the increased service that was made possible with the new cars.

This record has been made with cars that were similar to those which they replaced. The reasons for lower cost of maintenance are lighter weight, better construction and newness. Cars built along the lines of recent developments undoubtedly will have still less weight, more rugged construction and higher mechanical efficiency than those considered in the survey. Maintenance costs on

such cars reasonably may be expected to be still lower than those in question, and their effect on the system average will be correspondingly greater.

Savings in the maintenance of way account are difficult to determine, particularly where many types of cars run on the same track. It is evident, however, that light weight and better construction decrease the wear and tear on the rails, ties and roadbed. The effect is particularly great on special work and curves. The cumulative possibilities of major savings in the way department loom to proportions that the industry cannot afford to overlook.

REDUCTIONS IN OPERATING RATIO ON PROPERTIES THAT HAVE BEEN CONSISTENT PURCHASERS OF NEW CARS

	Number of Companies					
Reports showing reduced operating ratios: From that of preceding year	1928 25	192 7 27	1926 21	1925 23	1924 13	
For two successive years	7	6	9	5	*	
For three successive years	4	í	*	*	*	
For five successive years. *Information not available.	i	*	*	*	*	

The 41 properties for which group statistics are published show a reduction in maintenance of way for the past three years. Reference to the table shows an increase in 1926, but reductions in the two following years amounting to \$3,103,829. While this cannot be credited entirely to the advent of the new cars, they undoubtedly have assisted to some extent in the reduction. What is more significant is that the total cost of track maintenance and the cost per car-mile were less in 1928 than in any preceding year included in this survey.

Power costs reflect directly the energy consumed for car propulsion. Of course, there are miscellaneous uses for power that affect the total cost to some extent, and there are fluctuations in power rates that cannot be counted on. But when a group of 41 companies shows a continuing reduction in power cost from \$25,182,778 to \$24,032,052 in the five years, while the car mileage is increasing, it is concrete evidence that lighter and more efficient equipment is having an effect. Some of the roads that have made large substitutions of new cars for old have made far greater proportional savings in the power account.

In conducting transportation there has been an opportunity in past years to make a large saving when new one-man cars replaced old two-man cars. There still are many two-man cars in active service which can and

should be replaced with oneman cars. The possibility of making a saving in this way is, however, an individual problem of the railway contemplating a change. The 41 properties have shown a reduction in the conducting transportation account of approximately $\frac{1}{2}$ cent per carmile from costs prevailing in 1924 and 1925, indicating a somewhat greater use of one-man cars in the past year.

In evaluating the results of the new cars, it was deemed important to determine whether the financial advantage obtained from expenditures for modernization continued

COMBINED STATISTICS OF 41 ELECTRIC RAILWAYS WHICH HAVE MADE SUBSTANTIAL PURCHASES OF NEW CARS

	PURCH	ASES OF NEW		E MADE SCEE	
	1928	1927	1926	1925	1924
Passenger revenue Railway operating revenue Operating expenses:	\$273,837,560 282,850,910	\$275,374,350 284,169,950	\$279,266,930 288,222,930	\$277,041,210 285,273,910	\$278,655,440 285,946,740
Way and structures	\$23,077,329	\$24,665,669	\$26,181,158	\$23,245,795	\$24,235,305
Equipment	23,723,728	25,341,756	26,368,896	26,031,507	26,845,195
Power	24,032,052	24,563,967	25,248,494	24,776,262	25,182,778
Conducting transportation	101,000,235	102,343,496	104,132,084	104,226,560	102,556,668
Traffic and undistributeo	7,658,940	6,857,480	6,502,170	5,945,090	7,939,250
General and miscellaneous	28,580,583	27 ,599,903	26,621,448	26,958,604	26,567,997
Railway operating expenses Net revenue, railway operation Car-miles operated Total passengers Maximum cars operated	\$208,087,100	\$211,372,270	\$215,054,250	\$211,183,820	\$213,327,200
	\$74,763,810	\$72,797,680	\$73,168,680	\$74,090,090	\$72,618,540
	632,641,880	635,228,290	641,211,010	629,710,370	625,968,150
	5,138,800,000	5,167,910,000	5,286,640,000	5,235,550,000	4,842,240,000
	17,468	17,236	17,500	16,856	16,611
Centa per car-mile Operating revenue Operating expense:	45.14	44.75	44.95	45.30	45.68
Way and structures. Equipment. Power Conducting transportation. Traffic and undistributed. General and miscellaneous.	3.65	3.88	4.08	3.69	3.87
	3.75	3.99	4.11	4.14	4.29
	3.80	3.87	3.94	3.94	4.02
	15.96	16.11	16.24	16.55	16.38
	1.34	1.08	1.01	0.94	1.27
	4.52	4.34	4.15	4.28	4.25
Railway operating expense Net revenue, railway operation Operating ratio, per cent	33.02	33.27	33.53	33.54	34.08
	12.12	11.48	11.42	11.76	11.60
	73.57	74.38	74.62	74.03	74.60

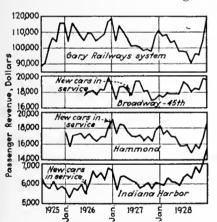
over an extended period. A study of the operating reports of the 41 companies shows definitely that there has been a favorable trend in the operating ratio at one or more times during the five-year period on all but one of them. This one is a large city property whose operating and political situation has been extremely difficult. Of the other 40 companies, one has been able to lower the operating ratio each year for five consecutive years, nine have lowered it four times in the same period, thirteen have lowered the ratio three times, twelve have lowered it twice and only five have showed a reduction in one year alone. Out of a total of 205 comparative annual reports from these 41 companies, 109 statements, or more than half of them, show an improvement in the operating ratio from the previous year. This is the more remarkable, coming at a time when the basic costs of operation on the whole are increasing and while traffic is at best holding its own. It is an indication that not all of the benefit can be obtained in the first year after new cars are installed. The distribution of the reductions in operating ratio is given in the accompanying table.

Further results on individual properties, published in the following brief summaries, indicate the great value the new cars have been in those places where they have been used. Still other reports will be published in the

third article in this series.

MANY COMPANIES ADD EVIDENCE THAT NEW CARS PAY

Gary Railways, Gary, Ind.—During the five years 1923-1927 inclusive this company spent \$2,500,000 for physical improvements, additional equipment and extensions. Now all the service is given with one-man cars,



Revenue for three lines of the Gary Railways new cars have kept up well. Scales are proportional for compari-

which handle successfully all the severest p e a k loads. Operating expenses went down from 34.1 cents per car-mile in 1925 to 29.8 cents in 1927. A further reduction was made in 1928.

A major part of the rehabilitation program was the purchase of 23 new double-truck one-man cars in 1926 and 1927. Sixteen centerentrance cars were

remodeled to bring them in line with the new equipment. Shorter headways were given on all but one line, the service being increased one-third to one-half. The headway on the Hammond division was changed from thirty

EQUIPMENT	MAINTENANCE	COSTS, GARY	RAILWAYS
Year	Total	Car Miles	Cents per Car-Mile
1926 1927	. 83.085	2,891,193 2,952,259	3.25 2,82
1928	. 62,783	2,900,685	2.16

minutes to twenty minutes, on the Broadway-45th Avenue from fifteen to ten minutes, on the Broadway-26th Avenue from five to three minutes, and on the Ambridge division from ten to five minutes. On the Indiana Harbor division alone the headway was unchanged.

Revenues on the lines with new cars have held up better than the system average despite severe automobile competition. This is shown in the charts.

Maintenance costs for cars are not kept separate, but the accompanying table shows the reductions along this

line for the system.

Indiana Service Corporation, Fort Wayne, Ind.—This company has been purchasing new cars at frequent intervals over a period of twelve years. The entire equipment was renewed between 1924 and 1928. The management is completely sold on the advisability of

operating modern equipment.

Fitchburg & Leominster Street Railway, Leominster, Mass.—During the past two years this property has been getting back some of the credit it once enjoyed when it was one of the seven best-paying street railways in New England. In the fall of 1926 four new cars were purchased, four more were bought in 1927, and two more in 1928. Fourteen of the best of the old cars were reconditioned, making a total of 24 cars available for service.

During the nine months prior to the purchase of the new cars the company ran behind \$50,000. During the first nine months of operation with the new cars there was a profit of \$41,000, making a total gain of more than \$90,000. The receipts increased from 43.4 cents per car-mile to 46.7 cents per car-mile, and the operating expenses were cut down from 47.9 cents per car-mile to 35.2 cents. While not all of the improvement can be attributed to the use of new cars, they are one of the important factors.

Chicago, North Shore & Milwaukee Railroad, Highwood, Ill.—This company has been a consistent buyer of new equipment. The largest recent purchases for interurban service were 30 cars in 1920, 19 cars in 1923, 23 cars in 1926 and 18 cars in 1928. At the end of last year 93 cars out of 170 used in interurban passenger service, or 55 per cent, were less than nine years old. In city service 32 cars out of 44 have been purchased in

the last ten years, or 73 per cent.

The company is replacing all equipment as it becomes obsolete. The present program calls for the purchase of new steel cars until all wooden cars are replaced, after which equipment will be standard as to weight, motors and control devices. This uniformity is expected to produce operating economics as well as an increased inducement to the passengers to ride.

Chicago & Illinois Valley Railroad, Ottawa, Ill.—In August, 1926, this property secured seventeen one-man cars. The result, by reason of more frequent service and decreased expenses, was quite satisfactory in additional income. After two years automobile competition reduced the revenue. The management is fully satisfied that its net earnings would be much less at this time if it were still operating the heavy two-man equipment.

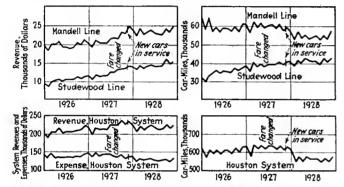
Chicago, South Shore & South Bend Railroad, Michigan City, Ind.—The present management in July, 1925, began a complete rehabilitation program, a prominent feature being the replacement of the old rolling stock. In August, 1926, 25 new steel cars were placed in service. Each is equipped with four 210-hp. motors and is capable of a speed of 67 m.p.h. In addition, two parlor-observation cars and two diners were purchased. These are trailers.

So rapid was the growth of business that twenty additional passenger cars, ten motors and ten trailers, were ordered six months after the first cars were received, and in 1928 an order for fifteen motor passenger cars

and five trailers was placed. All of these cars are of the same general design. They are of steel and are suitable for high-speed service.

Since the property was badly run down when it was taken over, rehabilitation naturally brought a marked increase in business. It is difficult to ascribe any particular proportion of additional revenue to the new cars. Likewise, the cost of maintaining the old cars had risen to such a point that it required extraordinary care to keep them working at all, so that a marked decrease in maintenance cost for the new equipment was inevitable. The faith of the management in the value of the new cars is indicated by its repeat orders.

Houston Electric Company, Houston, Tex.—This company has recently made several purchases of cars, of which the latest consisted of twenty cars which were assigned in November, 1927, to two lines, the Mandell and the Studewood. The Mandell line now operates approximately 69 per cent of the service with the new cars and the Studewood line approximately 84 per cent.



Receipts on two Houston lines have shown a greater increase since new cars were placed in service on them than they did from an increase in fare. Note that service actually has been decreased on the Mandell line without loss of revenue. Scales are roughly proportional so the relative effects may be compared

On both there has been a substantial increase in business, while the system has had a slight recession. The introduction of the new cars followed a fare increase five months earlier.

Operating costs went down during 1928, although it is difficult to determine what proportion of the reduction is due to the new cars. The cars have been 90 per cent one-man operated for several years, and in 1928 were

NUMBER OF CARS AND PURCHASES OF NEW CARS, HOUSTON ELECTRIC COMPANY

Year	Total Cars	Number of Cars Purchased	Amount of Investment
1921	197	0	0
1922		35	\$274,554
1923		10	114,566
1924		15	192,193
1925		0	0
1926		0	21224
1927		20	312,864
1928	293	U	U

STATISTICS OF RAILWAY LIN	NES, HOUSTON	ELECTRIC	COMPANY
Revenue:	1926	1927	1928
Mandell line	\$239,865 9.56	\$260,698 9,77	\$283,573 10.8
Studewood line Per cent of total	\$125,685 5.0	\$149,451 5.11	\$174,504 5.64
Entire system	\$2,513,727	\$2,666,251	\$2,631,555
Expenses: Entire system	\$1,663,219	\$1,708,428	\$1,566,927
Mandell line	715,816 9.85	719,000 8.61	658,331 9,67
Studewood line	419,922 5,78	472,081	492,294
Per cent of total Entire system	5.78 7.261.709	6.31 7,485,578	7.26 6,805,588

93.5 per cent one-man operated. Schedule speeds have been slightly increased.

Placing these new cars in service has caused much favorable comment. There were even a few squabbles as to which lines they should be assigned to for regular operation. They have kept down grumbling relative to the rate of fare.

Kentucky Traction & Terminal Company, Lexington, Ky.—Some five years ago this property was completely equipped with new, light-weight one-man cars. On the city division both the old and new cars had single trucks, but the new ones weigh 8 tons against 13 tons for the old. The amount of service was increased 32 per cent and the property was modernized in every way possible. As a result the revenue went up 17.7 per cent against an increase in operating expense of only 4.6 per cent. The increase in net has been sufficient to pay 7.5 per cent interest on the cost of the new equipment and leave an income 29.7 per cent greater than before.

The accompanying tabulation gives a summary of the results for four years prior to the use of new cars on the city division and four years after. On the interurban line new light-weight cars replaced obsolete heavy cars with similar results. It is the belief of the management that the re-equipment of the lines has made an improvement in financial results essential to continued operation of the property.

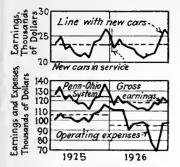
1,200 -	1		New Cars	*
1,000	Old Cars			
of Dollars				Net Revenue
Thousands of Dollars		/		Gen. and Misc. Traffic
400				Conducting Transportation
200-			,,,,,	Power
0 —	920-23		924-27	Equipment Way and Structures

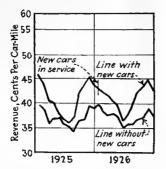
Replacement of all the equipment on the Lexington lines of the Kentucky Traction & Terminal Company saved the property

COMPARATIVE RESULTS WITH OLD AND NEW CARS, LEXINGTON CITY DIVISION KENTUCKY TRACTION & TERMINAL COMPANY

	Four Years with New Cars		Four Years with Old Cars		Дестепле	
	Amount	Per Car- Mile	Amount	Per Car- Mile	Amount	Per Car- Mile
Passenger revenue	\$1,152,065	0.281	\$975,039	0.313	\$177,026	0.032
Operating expenses: Way and structures Equipment. Power. Conducting transportation Traffic. General and miscellaneous	\$108,772 64,687 64,288 300,536 15,719 94,798	0.026 0.016 0.015 0.073 0.005 0.023	\$128,208 65,215 *48,089 266,615 7,393 104,182	0.041 0.021 0.015 0.086 0.002 0.034	\$19,436 528 16,199 33,921 8,326 9,383	0.015 0.005 0.00 0.013 0.003 0.011
Total operating expenses. Net operating revenue Taxes, local	\$648,803 \$503,262 79,876	0.158 0.123 0.020	\$619,704 \$355,334 70,459	0.199 0.114 0.023	\$29,098 \$147,927 9,416	0.041 0.009 0.003
Gross income Interest charges on new equipment at 7.5 per cent	\$423,385 53,786	0.103 0.013	\$284,874	0.091	\$138,511 53,786	0.012
Gross income after interest. Average reture on investment † Total car-miles Average car-miles per year.	\$369,599 4,105,368 1,026,342	0.090	\$284,874 3,110,222 777,556	0.091	\$84,724 19.39 995,146 248,787	

^{*} The Lexington Utilities Company charge to the K. T. & T. Co. is based on actual production cost, and has been applied to the average cost for 1924-28 to the four years 1919-22 as the coal coast was abnormally high in this period.
† Average annual return on the investment of \$179,289 in new equipment before interest charges.
Italics denote decrease.





On the Penn-Ohio system the line with new cars showed a gain in gross revenue and in receipts per car-mile while the rest of the system showed a loss. Note that operating expenses fell sharply the year after the new cars were installed

Penn-Ohio System, Youngstown, Ohio.—This system placed thirteen new 44-passenger cars in service in February, 1926, and has kept them almost entirely on one route, known as the Ohio Works-Struthers line. No change was made in headways, routing or fares. The old cars were one-man operated, as are the new ones. The line with new cars showed an actual gain in revenue while the remainder of the system had a decrease of 4.4 per cent. While it is not possible to segregate costs, the entire system showed a reduction of operating expenses of 8.2 per cent.

These cars, of course, are not all of the modern cars in service on this property. When the franchise was granted in 1919 there were 100 cars on the property. Since then cars have been added as follows:

Year	Number Purchased	Cost of New Cars
1920	12	\$80,000
1921	17	110,500
1924		64,000
1926		182,680
Total	52	\$437,180

Thus a total of 52 cars has been added, so that at least one-third of the rolling stock is modern.

Many favorable comments have been received, not only from private citizens but also from city officials and many others. The purchase of new cars was one of the many improvements which led up to the granting of an increase in fare which was obtained in February, 1928.

Ottawa Electric Railway, Ottawa, Ont., Canada.—In 1924 this company entered into an agreement with the city of Ottawa under which it was called upon to spend a large sum of money in improvements and extensions. Sixty new one-man, two-man double-truck steel cars were purchased and 34 double-truck cars were rebuilt.

Business reached a peak in 1921 due to the large number of returning soldiers. From this time receipts fell off slightly year by year. It is noteworthy, however, that the winter business is increasing while the summer business is declining. This is attributed to the increase in automobiles, the number of registrations being twice as many in 1927 as in 1921. Despite this competition the total passenger traffic in 1927 was 36,205,095 as compared with 37,902,198 in 1921, when the population was abnormally large. There was a reduction to 33,700,595 passengers in 1928, as the fares were raised from 5 cents to 7 cents with tickets at $6\frac{1}{4}$ cents.

Toronto Transportation Commission, Toronto, Ont., Canada.—When the Toronto Transportation Commission took over the Toronto Railway in 1921 costs were excessive. There were 830 cars, and in addition 70 cars were taken over from the Toronto Civic Lines. Of these,

483 have been scrapped and the remaining 347 have been completely rehabilitated and reconstructed. The management purchased 575 new cars, including two types of Peter Witt cars and large trailers. When the old system was taken over the average car had a seating capacity of 33.2; the present capacity is 53.7, or 62 per cent greater.

It is not possible to separate maintenance of equipment costs by types, but the following table gives an indication of the effect of modernization:

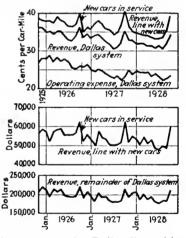
EQUIPMENT MAINTENANCE COSTS, TORONTO TRANSPORTATION COMMISSION

Year	Cents per Car Mile	Per Cent Reduction	Year	Cents per Car Mile	Per Cent Reduction
1920*	4.95		1924	3.86	4.9
1922 1923	4.51 4.06	9,9	1925 1926 1927 (7 mos.)	3.37 3.31 2.98	12.7 1.8 10.0

* Toronto Railway.

The figures for 1920 are from old records of the Toronto Railway. The labor rates are the same as they are today, but the amount of work done was barely sufficient to keep the cars moving, while today the rolling stock is kept in excellent condition and particularly presentable appearance. Savings in maintenance of equipment aggregate nearly \$500,000 a year. Part of this figure must be ascribed to the new shops and the complete rebuilding of the track system. As to the service given, the miles per pull-in for the system in 1923 were 2,309. In 1927 this had been increased to 8,244, and in 1928 to more than 11,000.

Dallas Railway & Terminal Company, Dallas, Tex. - Thirty new Peter Witt type cars were put in service on the Sunset-Second Avenue line in November, 1926, with no change in headways or routing. An increase in fares had been made in April, 1926, from 6 to 7 cents with five tokens for 30 cents. While there has been no increase in riding there has been a material decrease in operating expenses. The total expense has decreased from \$2,459,971 in 1926



Revenue on the Dallas line with new cars has held up well, both in total and on a car-mile basis. Expenses have shown a sharp drop

Voors Ended Oat 31

to \$2,187,050 in 1928, or more than 11 per cent. This reduction is, of course, due to a combination of elements, of which the new cars are one of the most important. It also has been possible to speed up the system.

The company is sure that these new cars have improved its public relations and made the customers better satisfied.

SPEEDS IN DALLAS GO UP WITH NEW CARS

	1 ear	s Enaea Oct	. 31
	1928	1927	1926
Car-miles per car-hour	9, 19	9.06	8.92
Per cent of car-miles operated with one man.	65.31	60.36	49.09
Maintenance of all cars, cents per car-mile	1.96	1.93	2.71
Total number of passenger cars at end of year	311	311	311
Number of new cars purchased	17		30
Investment in new cars	\$243,671		\$456,933

Executives Attend U. S. Chamber Annual Meeting

Many problems of interest to transportation men considered. Traction discussed by executive committee

MANY executives of the electric railway industry attended the annual meeting of the U. S. Chamber of Commerce held in Washington, D. C., during the week of April 29, 1929. In accordance with the custom of the past few years the executive committee meeting of the American Electric Railway Association was held in Washington during the week, the meeting starting with a luncheon on May 2. This arrangement has been adopted to assure adequate representation of electric railway men at this representative annual meeting of American business.

Several features of the U.S. Chamber program, in addition to national business problems and questions of business policy that occupied the attention of the general sessions, were of direct interest to the local transportation industry. The general keynote of the meeting was "The growing responsibilities of business." Shoup, president of the Southern Pacific Railroad, served as toastmaster at the annual dinner of the chamber on Thursday night, at which approximately 100 leaders of American business in the several branches of industry were introduced to the audience. Mr. Shoup, as a preliminary to this ceremony, called attention to the increasing confidence of the American public in business and business leadership. "This places upon business in turn," he said, "a growing responsibility so to conduct its affairs that it may continue to merit that confidence.'

PRESIDENT BARNES SPEAKS AT LUNCHEON

One of the chamber's luncheon conferences was of particular interest to local transportation men. President J. P. Barnes of the American Electric Railway Association was among the speakers listed to participate in the formal discussion. The general topic was "Traffic of the city and its trade area." In addressing the group on this subject Mr. Barnes called attention to the effort being made by electric railways to discharge their full responsibility to the public in the way of providing the most efficient possible transportation service, despite the fact that the public, in failing frequently to understand the fundamentals of its transportation problem, has made it particularly difficult for electric railways to provide that quality of service which they would like to give and which the public has a right to expect. "The streets were not designed for storing automobiles," said Mr. Barnes, and the fact that they are frequently used for that purpose produces a degree of congestion that results in seriously retarding the movement of public transportation vehicles, upon which 75 per cent of the public who use the streets are dependent. This problem is of more direct interest to business men than many of them are inclined to recognize, according to the speaker. As an illustration of this fact, he attributed the rapid development of neighborhood shopping centers in many cities to the delays and dangers of congested traffic conditions in downtown business districts. Since this presents a very serious condition to property owners and business men, it behooves the community and particularly business

men themselves to give greater attention to questions of transportation in their cities than they have been inclined to give in the past.

TAXATION DISCUSSED AT EXECUTIVE MEETING

An interesting innovation at the executive committee meeting of the American Electric Railway Association was an active and spirited discussion of electric railway taxation, sponsored by the taxation committee of the association and stimulated by the report of the chairman of that committee, H. L. Geisse, vice-president of the Wisconsin Valley Electric Company. After the routine business of the executive committee had been covered, President Barnes announced the plan of devoting part of the time available to a discussion of the fundamental question represented in the assignment to this committee.

Mr. Geisse suggested that one of the benefits which railway men could derive from the U. S. Chamber meeting is a realization that other basic industries, as well as the electric railways, are not in a prosperous condition and have many serious problems to overcome. He suggested further that there is a tendency among electric railway men to magnify in their minds the difficulties of finding solutions to their several basic problems. He held that the industry lacks enthusiasm in meeting these problems, and said that there seems to be more of a tendency to attempt to live down these difficulties by a slow, wearing process, than by a resolute frontal attack inspired by determination to formulate sound principles and provide permanent remedies.

The tax problem of the electric railways, according to Mr. Geisse, is related to that of the entire utility industry. In many instances power and transportation properties are joint enterprises. This may account for the reluctance evidenced by the executives of many of these companies to raise the issue of taxes in a fundamental way. Apparently, he held, there is the fear in the minds of some utility men of disturbing the situation with respect to satisfactory power rates for the sake of remedying a badly confused and unsound situation with

respect to the whole question of taxation. The speaker outlined the confused tax situation in the state of Wisconsin as an example of the need for giving serious attention to this subject. He held that it is important that utility men agree upon principles of equitable taxation in order that they may be in a position to suggest remedial measures which shall provide relief from the present intolerable conditions for the electric railways and at the same time insure a fair distribution of the tax burden in the public interest. In undertaking to secure relief from the present inequitable conditions, he suggested the importance of a proper understanding by utility men of the public's viewpoint with respect to taxation, as well as their own side of the problem. Data gathered by the committee illustrate in a striking way the present confused situation that exists throughout the country and the need for serious study of this problem.

COMMITTEE REPORTS PRESENTED

Following this introduction by Mr. Geisse, there was a spirited discussion in which many of the executives present participated. It seemed to be the consensus of opinion that the work of the taxation committee should continue along the lines on which it has been carried under Mr. Geisse's chairmanship. It was further suggested that there is need for similar studies of many other fundamentals before the industry, and it was

pointed out that several of the new special committees appointed this year by President Barnes are undertaking similar exhaustive studies of fundamental questions of

major importance to the industry.

F. W. Doolittle expressed the opinion that the industry is faced with two alternatives—to seek merely reduction in taxes, which can be obtained by local efforts, or to develop and secure the acceptance of a broad program susceptible of national application. L. S. Storrs spoke briefly in support of the idea of national action in this matter.

Brief reports were presented by the chairmen of the committees on finance, subjects and meetings, depreciation, insurance, industial relations, co-operation with state and sectional associations, convention exhibit, convention transportation, Charles A. Coffin prize, manufacturers,

and co-ordination of public transportation. J. W. Welsh presented the reports of the committees on policy, publicity, membership and manufacturers contact.

Announcement was made by President J. P. Barnes of the appointment of the committee on nominations—W. H. Sawyer, L. S. Storrs, Charles Gordon, C. A. Ellicott, B. I. Budd and J. G. Barry.

Comment on the recent regional conference at St. Louis was made by J. N. Shannahan, chairman Advisory Council. Mr. Shannahan also read a resolution expressing appreciation for the work done by Mr. Storrs in the four years during which he served as managing

director of the association. In reply, Mr. Storrs gave hearty thanks to all groups comprising the electric railway industry for the assistance they had rendered during

his incumbency.

R. H. Dalgleish, representing Frank H. Miller, told of the activities of the engineering association, and W. H. Boyce of the transportation and traffic association. F. G. Buffe, representing the Midwest Electric Railway Association, and W. E. Thompson, representing the New York State Electric Railway Association, also spoke briefly. It was decided to hold the next meeting of the executive committee on Friday, July 12, at New York City.

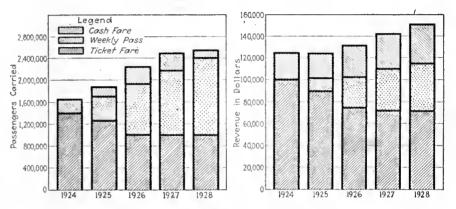
In a Future Issue

TAXATION — not merely a local problem but one with which every electric railway in the country is intimately concerned—to be discussed by a man who for years has given close study to this vital subject.

Traffic and Revenue Increase Continues at Levis

FIGURES for gross revenue and passengers carried during 1928 by the Levis Tramways, Levis, Canada, show a substantial increase over the preceding year. Revenue jumped from \$142,584 to \$150,814, a gain of 5.8 per cent. The number of passengers increased from 2,506,828 to 2,730,660, an increase of 9 per cent.

Increases occurred in all of the major revenue classifications. The revenue from cash fares increased 6.8 per cent. The revenue from tickets increased slightly, while the revenue from the sale of the weekly pass showed a substantial gain of more than 15 per cent.



Traffic has increased steadily at Levis since 1924

The increase in the number of passengers carried showed about the same trend as the increase in revenue, the largest gain being made in the pass passengers, a moderate gain in cash passengers and a very slight increase in ticket passengers.

Both the revenue and the traffic has been increasing steadily since 1924 although there has been no increase

Year	Cash	Tickets	Passes	Total
1924	\$22,269 21,642 29,585 32,478 34,685	\$102,291 90,684 75,475 73,402 73,878	\$11,956 27,818 36,704 42,251	\$124,555 124,282 132,778 142,584 150,814
	PASSENGERS	CARRIED BY	YEARS	
Year	Cash	Tickets	Passes	Total
1924. 1925. 1926. 1927.	222,643 216,420 295,851 324,781 346,847	1,433,552 1,287,744 1,078,301 1,065,182 1,077,665	377,047 853,515 1,116,865 1,306,148	1,656,195 1,881,311 2,227,667 2,506,828 2,730,660

Weekly passes started June, 1925. Sale of tickets changed in December, 1925, from strips of four for 25 cents to six for 45 cents.

	ANALYSIS	OF RE	VENUE IN	PER CE	NT	
	1923	1924	1925	1926	1927	1928
Cash Tickets Passes	81.3	17.8 82.2	17.4 73.0 *9.6	22.3 56.9 20.8	22.8 51.5 27.9	23.0 49.0 28.0
	ANALYSIS	OF TR	AFFIC IN	PER CEN	T	
	1923	1924	1925	1926	1927	1928
Cash Tickets		13.3 86.7	11,5 68.4 *20.0	13.3 48.4 38.3	13 42.6 40.4	12.7 39.5 47.8

^{*}Pass in effect seven months only.

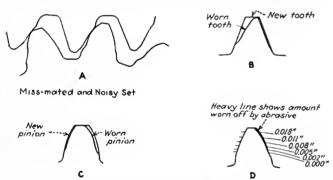
in the population of the territory served. Five years ago 86 per cent of the traffic and 81 per cent of the revenue was derived from the sale of tickets. Weekly passes were first tried in June, 1925. During that year they produced a little less than 10 per cent of the total revenue. The ratio has increased each year, however, reaching 28 per cent last year. In 1925, 20 per cent of the passengers carried used weekly passes, while in 1928 the number was 47.8 per cent of the total. During this period there has been a slight increase in the revenue from cash fares and a considerable reduction in the revenue from the sale of tickets. Figures showing the gross revenue and the number of passengers carried by years are given in accompanying tables, as well as analysis of the sources of revenue and traffic.

Noise Reduced by Improving Fit of Worn Gears

By E. S. SAWTELLE

Vice-President and General Manager Tool Steel Gear & Pinion Company, Cincinnati, Ohio

GRINDING gears by means of an emery compound to improve their fit, and thereby reduce noise, has recently been tried by the City Railway of Dayton, Ohio, and the Cincinnati Street Railway. By coating a noisy gear with heavy grease, applying about a pint of No. 36 emery powder, and running the car for a



Effect of energy compound in restoring correct shape of worn pinion tooth, as shown by plaster casts made during test on equipment of Cincinnati Street Railway

day, the City Railway has found that the noise can be largely eliminated, and that by cleaning off the gear afterward the emery can be removed completely. The City Railway has used this practice for several years on all cars where gear noise is especially evident. The gear expense has been small, and it has been possible to reduce the noise about 80 to 90 per cent.

Examination of a particularly noisy car in Cincinnati showed that the gear and pinion were both somewhat worn and were considerably shouldered. Plaster of paris casts were made of the teeth, as shown in the accompanying sketch. After the application of emery, the car was run for three trips by which time the noise had died down about 50 per cent. The car was then allowed to make a fourth trip after which the cases were removed, the emery and grease completely cleaned off, new casts made and micrometer measurements taken to indicate the wear since the start of the test.

No wear could be discerned on the gear, either by an

examination of the cast or by tooth micrometer measurements that were taken at very close intervals all the way down marked teeth. However, there was a wear of 0.018 on the pinion at the top of the tooth, tapering down gradually to about a negligible wear at and below the pitch line. It was plain in this instance that misshapen gearing was causing interference because the top or "land" of the pinion was too wide to match up with this particular gear. The emery wore away this high spot, developed a curve on the pinion tooth that matched up with its mating gear, and by so doing produced smoother action in the mashing. At the same time the wear on the pinion to produce this smoother action was negligible, and the wear on its pitch line was nil, hence this treatment did not materially reduce the life of the gearing though it did grind out the high spots.

After this test, the gearing was relubricated and put back into service. Two weeks later it was again examined, and the same marked teeth were measured for wear. This was to see if by any chance emery had remained in the mashing and this caused further rapid wear of the gearing. No evidence of this could be detected. During this test a careful check of bearings was also made to see if there was any indication of bearing wear or of emery getting into the bearings. However, nothing of this sort was found.

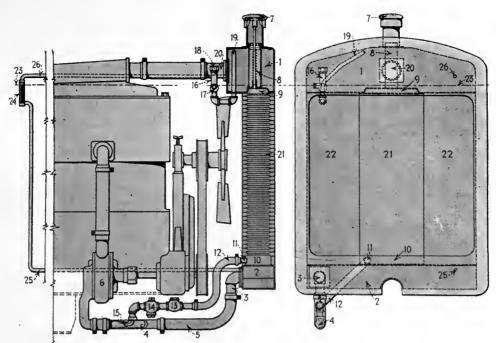
Less Than One Per Cent of Fifth Avenue Customers Are Parkers

INVESTIGATION made by the sub-committee on parking of the Citizens' Street Traffic Committee of New York, shows that less than 1 per cent of approximately 140,000 customers in the Fifth Avenue shopping district on May 6 availed themselves of the privilege of parking their automobiles in front of these stores. Nearly 3 per cent came by chauffeur-driven automobiles and a somewhat smaller number by taxicab. The great major-

ANALYSIS OF TR	ANSPORT	ATION USE	D BY 5TH	AVE. SII	OPPERS
	Pedestrians	Self- Driveu Automobile	Chauffeur Driveu Automobile	Taxi	Total
Department stores Specialty stores Ladies' apparel Mens' apparel Banks Miscellaneous	47,680 4,224 1,799 1,794	745 241 187 27 23 108	1,786 1,418 305 99 30 238	1,475 1,214 199 72 31 135	70,547 50,553 4,915 1,997 1,878 8,775
Total Per cent of total	130,332 93.9	1,331	3,876 2.8	3,126	138,665

MAXIMUM	HOURLY	TRAFFIC		
	All Day Total	Number in Maximum Hour	Maximum 1four	Per Cont of Total
Department stores Specialty stores Ladies' apparel Mens' apparel Banks. Miscellaneous	70,547 50,553 4,915 1,997 1,878 8,775	14,927 8,652 772 291 378 1,336	1-2 3-4 12-1 2-3 2-3 12-1	21. 15 17. 2 15. 7 14. 6 20. 1 15. 2
Combined total	138,665	26,356	1-2	19%

ity, about 94 per cent, were classified as pedestrians. Included in this classification were all users of public transportation vehicles, except taxicab passengers, who were separately classified. The survey was made by stationing checkers at entrances to some 50 representative stores in this district. No questions were asked of the customers, the checkers depending upon their own observations to determine the means of transportation used.



Cross and front sectional plans of the equipment for the Foutz cooling system, showing the location of the various parts

Efficient Cooling System for Bus Engines

System for dissipating the latent heat or vaporization warms engine quickly, maintains high jacket temperature and reduces cylinder heat stress, resulting in more efficient, reliable operation and less wear

ByADRIAN HUGHES, JR.

Superintendent of Bus Transportation United Railways & Electric Company of Baltimore

VERY bus operator realizes that the engine is a vital and important part of his equipment. maintenance and operation of the engine is a material part of his expense, and the reliability of the engine is the principal factor in the rendering of satisfactory service. Perhaps it is not fully realized by bus operators to what extent the cooling system affects the operating cost, the maintenance cost and the reliability of the engine. It does affect them to a great extent, and it is surprising that although the gasoline automobile engine has been in use for more than 30 years and has shown a decided advance in design, there has been little or no real advance in the cooling system. An increase in the

Developed

thermal efficiency of the engine has been impossible with the conventional type of cooling, either thermo-syphon or water circulation by pump.

However, an improved cooling system for internal combustion engines has been evolved, which, after a period of three years of experimenting and testing, has been pronounced satisfactory. The experimentation has been conducted on buses of the Baltimore Coach Company, the bus-operating subsidiary of the United Railways & Electric Company of Baltimore, by Clinton R. Foutz, inventor of the equipment. The new system holds promise of bringing about a decided improvement in the cooling of internal combustion engines, resulting in a higher thermal efficiency, more reliable operation and reduced wear. The improvements, which would be ex-

Key to Illustration at Top of Page

- 1. Radiator upper water tank.
 2. Radiator lower water tank.
 3. Radiator water outlet.
 4. Venturi tube.
 5. Hose connection.
 6. Water pump.
 7. Radiator filler cap.
 8. Specially designed filler device to prevent water entering condenser when filling radiator.
 9. Condenser upper tank.
 10. Condenser lower tank.
 11. Condensate outlet.
 12. Condensate suction hose.
 13. Check valve.
 14. Emergency stop cock.
- 15. Venturi nozzle.16. Deäerating and control

- 16. Deäerating and control valve.
 17. Blow-off outlet.
 18. Valve adjustment nut.
 19. Blow-off valve inlet pipe.
 20. Radiator Inlet.
 21. Steam condenser.
 22. Water core.
 23. Normal water level.
 24. Water level gage, mounted on dash.
- 24. Water level gage, mount-ed on dash. 25. Water level gage lower connection. 26. Water level gage upper connection.

pected from a theoretical consideration of this system, actually have been attained under all operating conditions.

The system uses the simple principles of the old low-pressure steam power plants. Part of the liquid is vaporized when the engine heats up, and this steam is drawn into a condenser in the middle section of the radiator. In the condensation process the vapor gives up its latent heat of vaporization. This enormous dissipation is in addition to the regular loss of heat as the temperature of the water is lowered, so that the capacity of the liquid for giving off heat is greatly increased.

Some of the advantages resulting from the use of this

cooling system are:

1. Cools effectively at 212 deg. F. or above, temperatures higher than is now possible with present conventional system.

2. Prevents boiling in hottest weather and eliminates unequal cooling and overheating.

3. Raises water jacket temperatures under light loads to higher degrees (192-220), and maintains them under full loads at sustained speeds for long periods of time. (With vented systems average temperatures are from 90 to 170 deg. F.)

4. Maintains higher water jacket temperatures during rest periods of motor and for longer periods of time.

5. Warms when the motor is cold and gives a quicker warm-up of cooling fluid, establishing water jacket temperatures at normal, above 212 deg. F.,

in about one-half the time and at threefourths of maximum engine power.

6. Increases brake-horsepower, as demonstrated on dynamometer test stand, under high temperature conditions.

7. Decreases fuel consumption greatly because of the increase in mean effective pressure directly due to reduction of heat loss and resulting improved combustion.

8. Permits the use of alcohol at atmospheric temperatures of 50 deg. F. and below without loss, and at water jacket terminal temperatures up to about 196 deg. F.

9. Insures the radiator against freezing by maintaining a constant predetermined percentage of alcohol indefinitely without loss by evaporation or boiling away.

10. Cools better at higher altitudes. (Operation is independent of altitude except that the cooling efficiency increases with the height above sea level, and at great altitudes may exceed by 20 per cent

the efficiency of conventional types, without considering the change of atmospheric temperature.)

11. Reduces to a minimum the scale formation of lime and other alkaline deposits in the radiator and on the water jacket walls by eliminating evaporation and boiling away of the liquid. (Scale is a non-conductor of heat and deposits irregularly in water jackets and also clogs the radiator.)

12. Improves lubrication because of lessened dilution and uniform high working temperature.

HIGH TEMPERATURES ATTAINED

The primary object of the Foutz system is to operate the engine at very high water jacket temperatures—in fact, the water may be above the boiling point at atmospheric pressure. But even at these temperatures the water inside of the water jacket remains liquid. It does not boil and circulates properly, thus providing the necessary heat dissipation from the cylinder walls and absolutely preventing the engine from overheating. An overheated engine is one in which some part fails to function normally. No matter how high the water jacket temperature may be, an engine is not overheated until the oil is burned from the piston rings and cylinder walls. In the conventional system seizure may occur even



In the latest design, the central portion of the radiator is used as the condenser and the two side portions for the circulation of water

though the jacket temperature may be considerably lower than the boiling point of 212 deg. F. when distortion occurs. Overheating usually is the direct result of unequal heat dissipation from wetted surfaces of the combustion spaces, causing some parts to become hotter than others.

The condenser for one of the first in-

stallations consisted merely of

copper coil mounted on the front of

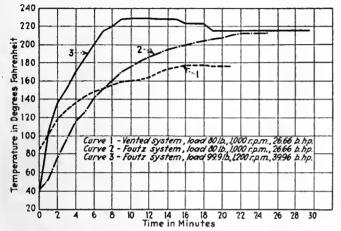
In the conventional vented automobile cooling system this overheating occurs before the water reaches

its atmospheric boiling point, because no pump can either lift or force water near this temperature and the circulation of water practically ceases. As this occurs the vented system breaks down and overheating results. In the Foutz system the circulation does not decrease at high temperature, but increases. Thus it is evident that the overheating is not caused by temperature of operation but by unequal heat dissipation. By balancing the circulating fluid by the pressure of its vapor, keeping it liquid, at a high predetermined temperature for operation, and utilizing the fundamental principle of the latent of vaporization, this system at temperatures of 220 deg. and 230 deg. F. has a capacity of heat dissipation several times greater than any vented system at 190 deg. F., assuming the vented system could be operated at so high a temperature.

the bus

The equipment for this system is surprisingly simple. For application to the usual pump-driven circulating system it consists of four principal parts. The first part is a temperature control valve adjustable to the temperature of operation desired, the second is a Venturi tube with nozzle of special construction, the third is a condenser, and the fourth is a safety blow-off valve set for about 5 lb. In addition to these parts, a water level gage should be mounted on the dash of the bus, and, if desired, temperature indicating instruments also can be installed.

The Venturi tube is placed in the lower suction hose connection from the bottom of the radiator with the nozzle facing the pump. The connection between the Venturi tube and the bottom of the condenser and the connection between the Venturi tube and the pump are made with flexible hose connections, but it is necessary



Comparative warm-up periods for the conventional vented and Foutz systems. Under the same load the vented system required sixteen minutes to reach a temperature of 92 deg. F., while the Foutz system required only 5.5 minutes. Curve No. 3 shows that at a constant load of 39.96 b.hp. a 92-deg. temperature was reached in 1.8 minutes

to insert a piece of brass pipe in the latter connection because of the low pressure which sometimes exists. The condenser is connected between the air space in the upper part of the radiator tank, at a point as high as possible above the water level, and the nozzle of the Venturi tube. The temperature control valve is connected with the top of the radiator.

The radiator and water circulating system must be entirely scaled against admission of air, so that the radiator filler cap must be supplied with a gasket. It is also necessary to reduce the area of the radiator through which the circulating water itself passes from the water jacket of the engine because a considerable cooling is obtained by the condensation of water vapor in the condenser. The safety valve is connected from the air space at the top of the radiator above the water level and is usually set for about 5 lb. pressure, corresponding to 230 deg. F.

In the early experiment the condenser consisted merely of a copper coil mounted on the front of the bus, an arrangement which detracted from the appearance of the bus, and which also obstructed the passage of air through a large area of the radiator. To overcome these objections a radiator was designed, the central portion of which was used as the condenser and the two side portions for the circulation of water. Its appearance is very similar to the ordinary radiator.

When the engine is started cold and water is circulated by the pump a vacuum is produced in the Venturi tube and air is drawn from the condenser. This air is mixed with the water by the impeller blades and forms an emulsion of air and water. This air-water emulsion may become so intimate that the proportion of air entrained may exceed 50 per cent of the water. The specific heat of a 50 per cent mixture of air and water is only 0.62, so that less heat is carried from the engine walls and the warm-up period therefore is shortened.

As the engine warms, the air is driven off until there is finally no air entrained in the water. The average specific heat during the warm-up therefore is the mean difference between 0.62 and 1.00, or 0.81, so that the rate of heat transfer is reduced 19 per cent. In addition to this factor of the reduction of the warm-up period the water capacity of the cooling system is reduced by about one-fifth and the water cooling area of the radiator one-third by the use of the center section of the radiator as the condenser. There is therefore just two-thirds of the water cooling area and four-fifths of the quantity of the water, which would reduce the warm-up period by the product of these two to eight-fifteenths, or 53 per That is practically one-half the time. factors, combined with the reduction of specific heat of the fluid, gives a warm-up period equal to the product of 53 per cent and 0.81, or about 43 per cent of the usual time:

When the temperature of the fluid approaches the point for which the temperature control valve has been previously set, say 220 deg. F., and sufficient steam is generated, the valve opens and allows the entrained air and a little vapor to escape. During the warm-up period the condenser does not act as a cooling factor except for the detained air.

After the contained air is ejected from the system the second stage of operation starts—the circulation of water under its own saturated vapor pressure. By this process the boiling point is raised 58 deg. above the atmospheric boiling point of 212 deg. At 212 deg. F. in this system the liquid's fluidity is identical with water in a vented system at 100 deg. F.

As the temperature of the circulating water increases, there being no more air present, more and more vapor is formed in the jacket and drawn into the condenser. The cold condensate which forms is returned through the Venturi nozzle and into the pump. The dynamic suction at the Venturi nozzle varies with the speed of the pump and the engine, increasing rapidly with the engine speed. With increased engine speed more heat is generated and absorbed by the water, but this is taken care of by the greater dynamic suction on the condenser which increases the heat dissipation. The condensation thus forced keeps the steam pressure from increasing by reducing the saturated vapor volume. By this means a system of heat dissipation is established which is without limit as to capacity. With proper design an amount of heat dissipation may be procured to meet full load conditions or, under partial or light loads, to maintain approximately the same high temperature necessary for efficient engine performance.

The static vacuum created in the condenser by the Venturi nozzle varies from 2 or 3 in. of mercury to 20 in. or more. Vapor is drawn from the surface of the water in the radiator and condensed, the latent heat of vaporization being dissipated in the change from steam to water. Thus ebullition, or the boiling of water on the surface of the engine jacket, is prevented. Cold water is returned to the pump and to the hot water jacket as fast as formed in the condenser. For every

pound of steam entering the condenser from the surface of the water in the radiator a pound of cold water is returned. Thus the quantity of vapor given off regulates the volume of water returned both from the condenser and the radiator, and an automatic auxiliary cooling system is established. Since nothing but steam can enter the condenser, this system assures rapid heat dissipation at high temperatures when the engine requires it and a much retarded dissipation of heat until the engine reaches its high normal operating temperature.

Because of the ability of this invention to circulate water at very high temperatures and to maintain it in its liquid state at those temperatures the water capacity of the engine jacket and associated parts can be reduced, and by this reduction in weight of water the warm-up period can be further shortened. By virtue of this the Foutz system will operate under light loads at temperatures from 30 to 50 per cent higher than would be obtained with the conventional cooling system. Above this temperature point the rate of cooling becomes more and more rapid as the temperature rises, but the comparison with the conventional cooling system cannot be carried beyond its breakdown, the limit of which is about 180 deg. in the pump suction and 203 deg. in the jacket.

EXPERIMENTS STARTED THREE YEARS AGO

The inventor of the system, Clinton R. Foutz, asked permission to try out his equipment on buses of the Baltimore Coach Company three years ago. The possibility of improvements and savings in the bus operation seemed sufficient to justify the small trouble and expense involved in the demonstration, so Mr. Foutz was permitted to equip two buses. The first equipment was rather crude and naturally many minor difficulties were experienced, but it demonstrated that the principle was absolutely correct.

Despite the crude equipment for the first two installations the results were entirely satisfactory. Consequently, a third and improved equipment was designed. Further installations were made, until a total of ten buses were equipped. These buses have operated a total of more than 662,000 miles. The practical results obtained have been so satisfactory that it has been decided to proceed gradually with the equipping of additional buses.

The improvement in the operation of the buses equipped with the Foutz system has been pronounced. In either cold or warm weather the engines heat up to the maximum temperature in less than two-thirds the time ordinarily required. They are particularly satisfactory in the power obtained, freedom from knocking, etc. They operate continuously in any weather and under ordinary conditions of load at temperatures from 50 per cent or more above temperatures formerly obtained. The reliability of the engines has been increased, very few road calls being necessitated by engine trouble.

In an accompanying illustration curves are reproduced showing the comparative warm-up periods for the Foutz and conventional cooling systems. Curve No. 1 for the conventional vented system at a constant load of 26.66 b.hp., shows a total temperature rise of 92 deg. F. in 16 min. Curve No. 2 for the Foutz system at the same load, shows a 92 deg. F. temperature rise in 5.5 min. The maximum temperature of 212 deg. F. was reached in 22 min. Curve No. 3 for the Foutz system operating at a constant load of 39.96 b.hp. shows a 92 deg. F. temperature rise in 1.8 minutes. The maximum temperature of 228 deg. F. was reached in 9 minutes. When

the engine, cooled by the vented system, was operated at 1,800 r.p.m., with the temperature of the water at the outlet of the water jacket at 200 deg. F., it developed 49 hp. and consumed 0.669 lb. of fuel per horsepower-hour. When the engine cooled by the Foutz system was operated at 1,800 r.p.m., with the temperature at the water jacket outlet at 228 deg. F., it developed 51.1 hp. and consumed 0.672 lb of fuel per horsepower-hour. At 1,600 r.p.m. and a temperature at the water jacket outlet of 218 deg. F., the Foutz-cooled engine developed 49.5 hp. and consumed 0.652 lb. of fuel per horsepower-hour.

Because of the quick warm-up and higher operating temperature practically no carbon forms in the cylinders. This reduces the wear on the cylinder walls materially and also decreases an important labor item. Carbon is cleaned from the engines every 20,000 miles instead of every 5,000 miles as formerly, and even at the longer period the carbon formation is merely a soft soot that can be wiped off instead of the hard baked carbon usually found. Cylinder wall wear has been reduced from 0.012 in. to 0.004 in. in 19,000 miles. Also, trouble with sticky, gummed valves and sticky piston rings has been eliminated.

Preservative Treatment Used for Wood in Car Bodies

By Otto Gottschalk Engineer of Railway Equipment Department Havana Electric Railway

ONSIDERABLE difficulty was experienced by the Havana Electric Railway in the past from dry rot, and wet rot, particularly at points where water could accumulate but no air could enter to dry up the moisture. Checking of the woodwork of cars also took place where the wood was exposed to the hot sun rays. A native wood called Sabico was used for end sills, corner and window posts. This wood was very hard and was not attacked by the wood borer called "Conejen," but it was subjected to checking and warping, even more than the longleaf yellow pine used elsewhere in the car bodies. To overcome this trouble Saums' preservative has been very satisfactory. The wood in the car stood up very well and no checking or warping took place, and no rot has developed. The "Conejen," or wood borer, has been unable to enter the yellow pine because of the difficulty of penetrating the surface which hardened after the preservative had been applied.

The company now treats all wood boxes, ladders, lockers, bodies, etc., by a brush application. Dipping is not used because the wood becomes too hard and difficulty is experienced with screws or nails. All of the old type cars passing through for general repairs have been treated in this way.

An interesting test was made by tapping a section of Sabico 4 in. x 7 in. x 25 ft., from a dry log. During the cutting a certain amount of warping or bending took place, due to the internal stress being released when the fibers were cut by the saw. A brush application of the preservative was made at once. The section has been lying out in the elements for three years, and no warping or bending has developed and no rot exists. Another piece was cut from the same log, and not treated. This was placed alongside the first. A slight indication of rot has been observed and checking has developed to a point where the section is useless.

Track Costs Studied at Detroit

Steel ties and monolithic concrete construction have proved advantageous

By F. A. NOLAN

Assistant to the General Manager Department of Street Railways, Detroit, Mich.

AMONG the changes made when the properties of the Detroit United Railways were taken over by the city of Detroit for operation as a municipal project was the introduction of steel twin ties. Prior to 1920 the United was using oak ties on a concrete foundation for the building of all standard paved track. The city of Detroit desired a faster and cheaper method of track construction, and an investigation was authorized to determine how this could be accomplished. Steel twin ties were brought to the attention of those in charge of this investigation and the use of these ties was immediately tried. The first stretch of track of this type was laid in September, 1920. This installation and others made subsequent thereto have been subject to

companying table gives a summary of three typical track jobs recently completed. Base rates paid for labor averaged 55 cents per hour during the period in which this work was done.

The Mack Avenue extension, a typical all-new job of 16,861-ft. single-track length, required a total of exactly 49 days from the time the first shovelful of dirt was removed until cars were operated over it. This was a winter-time job and special care had to be taken to prevent portions of the concrete from freezing. The total cost was \$161,013.33, and the unit cost of \$9.55 per track-foot is regarded as a thoroughly satisfactory figure. Similar data are shown for the Grand River Avenue and the Michigan Avenue reconstruction jobs. The first of these was paved with asphalt, for reasons of a special nature at a cost somewhat in excess of that for standard compressed concrete. The total for 20,787 ft. of single track was \$218,543.76 and the unit figure \$10.51 per foot. The total elapsed time on this job was 48 days. The Michigan Avenue job is detailed in a similar manner. The total cost for 20,112.2 ft. of single track was \$206,025.92, equivalent to \$10.24 per

track-ft. These figures are based on an analysis made by the A. C.

Nielsen Company.

Better paving is a third major feature of the present system. The brick pavement formerly used was generally unsatisfactory. The brick themselves were too soft to withstand the heavy vehicular traffic, and it was practically impossible to get a watertight top surface. Sand used under the ties was ultimately washed away by water which seeped down from above. This permitted rails to settle and was the cause of much trouble. Furthermore, the brick top heaved when water froze underneath and the brick which projected was quickly cracked and worn down. This caused low spots when the frost left the ground and

patching designed to fill in the low spots was never altogether satisfactory. Asphalt was equally troublesome, principally when the flanges of interurban wheels broke it away from the rails. This permitted water to get under the top surface and heaving and cracking were

The compressed concrete pavement has been all that the others were not. Pavement of this type laid nine years ago is in good condition today. Tarvia patches have been found to hold satisfactorily under all conditions and there was no possibility of trouble even in places where other street or excavation work has made extensive patching necessary.

Corrugation has developed on some of this new track design and this was first thought to be the result of non-flexing construction. Investigations, however, have convinced the management that this is not entirely the case. A determination by the Detroit Testing Laboratories showed incipient corrugation in the rail before it was placed in the track and subsequent tests show that this same rail corrugated as quickly in unpaved tracks laid with broken stone ballast as in paved track constructed by the methods herein described.

Long life is another important feature of the new

SUMMARY OF DETROIT TRACK CONSTRUCTION COSTS

Location	MACK AVENUE		GRAND RIVER AVENUE		MICHIC AVENU	
Type of work done	New Extension Single Track 16,861.0 Ft.		Reconstruction Single Track 20,787.0 Ft.		Reconstru Single Ti 20,112.2	rack
I.C.C. General Acet. Description	Total	Per Track Foot	Total	Per Track Foot	Total	Per Track Foot
504 Grading. 505 Ballast. 506 Ties. 507 Rails, joints, etc. 508 Special work. 510 Track and roadway. 511 Paving. 516 Crossings. 517 Signals. 519 Telephone lines. 521 Distribution system. Totals.	\$21,338.07 31,528.48 21,077.09 27,102.07 7,894.17 26,378.78 24,014.88 859.71 91.05 531 723.72	1.87 1.25 1.61 .47 1.56 1.42 .05 .01	\$26,856.53 40,663.59 63,338.30 55.12 49,680.10 37,151.06 394.15 	1.96 3.05 { 2.39 1.79 .02	\$32,602.82 30,311.13 28,525.63 33,336.81 2,890.60 37,184.19 39,958.36 708.12	1.51 1.42 1.66 .14 1.85 1.99 .03

close observation and results have been highly satisfactory. The total length of single track in service at the end of 1928 was 81.85 miles.

The construction using steel twin tics on a concrete foundation with a compressed concrete pavement results in a non-flexing track, and this is considered one of the outstanding advantages of the present construction practice. Tests have convincingly demonstrated the existence of a watertight bond between the rails and the compressed concrete top. This prevents the formation of water pockets and gives permanent assurance against pumping. Several sections of this track have been cut out and it has been found watertight in all instances. The concrete invariably carried such impressions of the rails as to illustrate perfectly the bond which had been achieved. The non-flexing track has never caused any trouble to the rolling equipment.

Some of the electrically welded joints used prior to June, 1926, gave trouble due to lack of sufficient strength, and cracks permitted water to enter. The adoption of the Thermit process for track joints did away with the trouble, however, and there has not been a single failure in a properly made joint in two years.

Reduced cost is another important advantage, an ac-

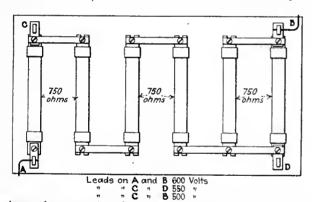
track design. None of the new track has even approached the end of its usefulness, but a recent examination of one of the oldest sections-St. Jean Avenue between Warren and Shoemaker-indicates clearly what life may be expected. It appears that this track will be good for fourteen to twenty more years of use and that the total life will be somewhere between 21 and 28 years. Apparently rail wear will be the determining factor. An examination at the time this section of the track was opened up showed that all other parts of the rail, ties and concrete were in exactly the same condition as when first put into place. There was no evidence of water having worked along the rail in either direction and the compressed concrete pavement bore clearly legible imprints of the die marks giving the rail mill's name, the date the rails were rolled and the numbers used to designate the rail section.

Testing Line Breakers

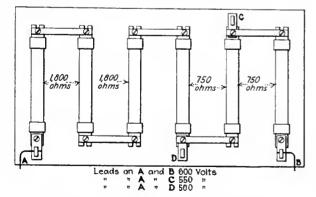
By R. S. Beers

Railway Engineering Department General Electric Company

WHEN a motorman reports that the line breaker on a car does not always close, a test of some kind is desirable to ascertain whether the cause is low line voltage or a weak operating coil. The most accurate test, of course, is to use an ammeter and variable resistance, first measuring the minimum current required



Resistor tube connections for testing all type DB-976 and DB-981 line breakers having coil specifications F-323352



Arrangement of resistor tubes for testing all DB-986 and DB-987 line breakers with coil specifications F-3046442

to close a line breaker that has a good coil and then making the same test on the line breaker whose coil is doubtful. When an ammeter is not available a simple "rough and ready" test may be made with no other equipment than resistor tubes. This test depends on the fact

that a resistance connected in series with a line breaker will absorb some of the line voltage and the line breaker the remainder.

Assume the line breaker will close when 200 volts are applied to it. By selecting the proper amount of resistance to connect in series, 300 volts may be absorbed by the resistance and 200 by the line breaker. With this arrangement the line breaker will just close when 500 volts are applied to the combination, although only 200 will be applied to the line breaker. If something is wrong with the line breaker so that it will not close at 200 volts, it obviously will not close when 500 volts are applied to the combination of resistance and line breaker. The correct resistance may be determined quickly by calculation if enough of the line breaker constants are known. If they are not known the proper resistance may be determined by a cut and try method.

The success of the test depends on an approximate knowledge of the trolley voltage, although making the test with two values of resistance is a reasonable check on the line voltage. In other words, if the line breaker fails to close when the resistance for 550 volts is in circuit and closes when the resistance for 500 volts is used, it is safe to assume the trolley voltage is about 500.

The test of a line breaker mounted on a car is made by removing the fuse from the MS-46 control switch and using the fuse clips as an easy way of connecting the resistor tubes in the line breaker circuit. Spring clip connectors, such as are commonly used for radio, are the simplest means for making the connection to the fuse clip. Then close the control switch and turn the controller handle to the first point to energize the line breaker, which should close. If it does not close fully, probably the coil is partially short circuited and does not give the pull it should. Although it may be caused by other faults, such as excessive friction brought about by too much wear of the bronze bushings that separate the armature and frame where they are hinged together. This excessive friction results only when the frame is magnetized. When the operating coil is dead all the parts move freely, but as soon as they are magnetized excessive friction is present and can be removed only by replacing the worn bushings with new ones.

Riders Outnumber Readers

COMBINED circulation of the Ladies' Home Journal the Pictorial Review and the Woman's Home Companion in our large cities is extremely small compared to the number of car riders, according to F. R. Barnard, Street Railways Advertising Company, writing in Printers Ink. Interesting figures to prove this are given in a table which is reproduced below.

	Population	Ladies' Home Journal	Pictorial Review	Woman's Home Companion	Monthly Street Car Riders
Chicago	2,886,121	77,632	54,246	64,448	135,660,915
Philadelphia	1,922,788	55,154	43,071	26,434	79,671,094
Detroit	995,668	38,059	32,458	33,693	41.297.177
Cleveland	889,519	28,004	27.604	27.877	32,669,933
St. Louis	803,853	25,456	30,493	22,335	34,855,505
Baltimore	773,580	19,798	20,631	15.925	27, 168, 400
Pittsburgh	613,422	21,245	18,787	21,599	26,910,071
Buffalo	536,718	15,667	14,560	12,716	16,293,039
Milwaukee	484,595	15,271	11,009	16,885	18,436,409
Kansas City	467,600	14,665	17,014	14,089	15,690,995
Cincinnati	406,312	17,308	15,780	16,333	14,439,990
New Orleans	404,575	6,632	5,098	8,037	11,970,356
Indianapolis	342,718	12,325	17,507	15,701	9,877,777
Louisville	257,671	7,757	6,585	7,845	8,959,964
Providence	243,378	12,622	12,929	8,339	12,973,110
Atlanta	222,963	7,200	7,447	8,601	8,014,805
	12,251,481	374,795	335.219	320,857	494,889,540



Car pull-in "zero board" at one of the Atlanta carhouses. Figures are posted each day, thus keeping the men informed of the relative standing in the competition for the best record

Improved Machinery and Practices

Raise Maintenance Standards

on Southern Properties

By

G. C. HECKER

Special Engineer American Electric Railway Association

Partial ETHODS which have led to a reduction of 49 per cent in equipment maintenance costs and have eliminated 87.5 per cent of the pull-ins on four Southern properties have been discussed by the author in the last two issues of this paper. These four properties—Atlanta, Birmingham, Memphis and New Orleans—have made this remarkable record in a six-year period beginning in 1922.

It was in April, 1922, that the Electric Railway Association of Equipment Men, Southern Properties, was organized. On every hand appears evidence that the record of progressive improvement on these properties is definitely related to the activities of the association. These articles have been written, therefore, to direct attention to a noteworthy achievement and to emphasize the value of an association such as this one. There has been no thought of setting up costs on these properties for others to shoot at. It is the steady improvement year after year that makes their performance impressive.

Some of the practices of the mechanical departments already have been discussed. The present article directs attention to specific shop practices to illustrate the adoption of improved methods and the increased use of machines and special devices.

In Atlanta, equipment is overhauled on a 60,000 carmile basis, except a few old cars which are overhauled on a 50,000 mile basis. Some of the methods used, and the special equipment installed for facilitating the work and reducing costs, are illustrated.

The liberal use of jib cranes, monorail and transfer cranes has greatly simplified the handling of the heavy equipment in the shops. A home-made electric hoist mounted on a jib crane has increased the capacity of the wheel press about 30 per cent, with less physical effort. The hoist is worm driven and requires no brakes.

Failures due to lightning have been reduced greatly by equipping all cars with aluminum cell arresters and impedance coils. Ground wires bolted direct to the bolsters give a short, low-resistance path to ground. Careful inspection and periodic testing insure good condition of the arresters and connections during the lightning season.

Other interesting practices that have reduced equipment troubles in Atlanta are the use of dot pressure lubricator fittings on brake valves, safety stops for air brake cylinder levers, field jumper wires placed inside of motor cases, flanges on axle collars to prevent entrance of dirt between collars and bearing flanges, installation of bolts in the bottom of journal boxes to support dust



Dismantling car trucks in Atlanta. All parts are removed and repaired or reconditioned parts are used to replace them

guards, controller drum changes made to eliminate arcing and short-circuiting, and reboring and equipping older motors with new housings.

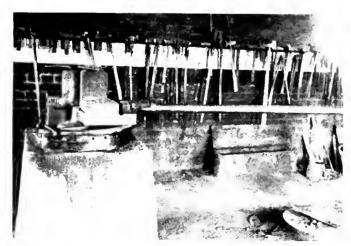
In Birmingham the car cleaning, inspection and oiling are done on a 1,000 car-mile basis. The system now in effect has permitted a reduction of inspectors from 72 to 40, and in addition has eliminated a night crew of six men on truck repairs.

Some of the practices developed on this property are shown in the illustrations. Chrome-nickel steel armature shafts replace all worn or broken ones. Hair cracks in axles are located by first wiping the surface clean and then passing a blow torch flame over the surface. Where a crack exists oil will come to the surface. It is stated that this simple method is very effective and has reduced greatly the time needed to locate cracks in axles.

Bronze bearings have replaced all babbitt-lined arma-

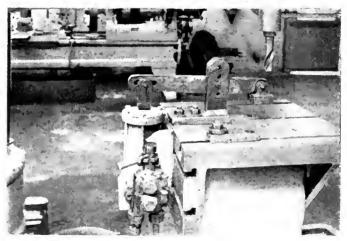
ture and axle bearings. They are tinned while being spun around by a hand wheel, an ingenious jig clamping the heated bearing. Axle bearings are now bought finished on the outside and rough-bored $\frac{1}{8}$ in. to $\frac{1}{16}$ in. under size. They are finished to fit individual axles as needed in a specially designed chuck. The chuck is made for the lathe on which it is to be used, the interior being finished after fitting to the lathe, so that it is perfectly true. To line up a bearing it is inserted in the chuck and the collar is tightened on a taper thread. The outside of the chuck and the bushings used are split so that the bearings are clamped tightly in place as the collar is screwed up. This practice not only has increased the life of axle bearings, gears and pinions more than 15 per cent but has greatly reduced gear noise.

On motors of the older types the gear case support has been converted from two-point to three-point by



This Kerlin bending machine has eliminated anvil and face-plate work in Atlanta

It bends all steel bars up to \$\frac{2}{3}x6\$ in, and round bars up to \$2\frac{1}{2}\$ in, diameter. The bars are bent to any angle, with short or long radius. It is especially advantageous in forming a number of similar pieces.



Holding work with an air clamp

In Atlanta a home-made air clamp for holding work on the table of a radial drill press has eliminated about 90 per cent of the time formerly required to fasten it to the table with bolts. The device consists of a brake cylinder and piston and a motorman's valve, operating the clamp through a lever.

welding a steel strap to the top of the case and the motor frame. This has reduced gear case maintenance work on these equipments at least 50 per cent.

In the general overhauling of the older type motors all steel conduit has been removed and the cables incased in duraduct. As a result many failures due to grounded

car wiring have been eliminated.

The life of half-ball brake hangers has been doubled and much chattering eliminated by the use of Alemite lubrication. This practice won a prize last year in ELECTRIC RAILWAY JOURNAL'S maintenance contest.

Installation of a pit grinder has practically doubled the life of car wheels. A new wheel press with a hydraula-

graph for recording pressures has facilitated wheel installation and reduced the cost of the work. In removing wheels from axles a split steel shell substituted for the pins ordinarily used has eliminated the danger to workmen as well as any possibility of broken wheels or bent axles.

A screw-jack hoist driven by a railway motor has reduced the time for raising car bodies and increased the factor of safety. Trucks are run out from cars under their own power by using a flexible cable connected to the hoist controller and one of the motors on the truck.

Many other improvements that have contributed to the reduction of maintenance costs in Birmingham



Spray-washing cars in Birmingham permits more frequent cleaning

Every car is now washed once in six or seven days. The ear is passed slowly through the spray, after which the dirt is toosened with long-handled brushes. The car roofs are washed, and it is claimed that this climinates streaking of the windows and sides. Cars are rinsed by passing them several times through the spray.

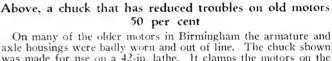


Saving three-fourths the time of straightening axles

This three-wheeled buggy, developed in Birmingham, holds the axle between centers while it is straightened cold in a hydraulic press. It has cut the time to about one-fourth that required with the old practice of preheating.

include a gas-fired oven for heating car springs, a gasfired rivet heater, a baking oven for armatures and fields, individual motor drive instead of shafting and belts, guards for all gears, belts and band wheels, improved lighting and other changes that have bettered working conditions.

A lumber storage shed 140x40 ft. adjacent to the woodworking department has its sides made entirely of sliding doors, so that with a minimum of handling lumber can be unloaded directly from a car onto the proper storage racks. A cut-off saw centrally placed in the shed



was made for use on a 42-in, lathe. It clamps the motors on the pole-piece seats, insuring that the housings, after building up with electric welding, will be bored true. After boring the armature hearing fit the chuck can be shifted over to bore the axle bearing fits. A taper pin through the bottom of the chuck insures correct spacing of centers.



A truck that replaced four laborers in Birmingham

This storage battery truck, equipped with a locomotive type crane, is used for handling motors, armatures and other heavy parts. The same truck has also made unnecessary the periodic part-time services of a crew of twelve track laborers to handle car wheels.



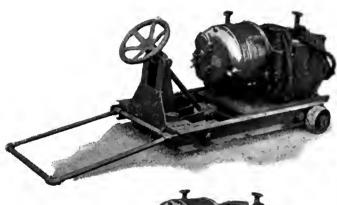
Below, overhauling electrical equipment in New Orleans

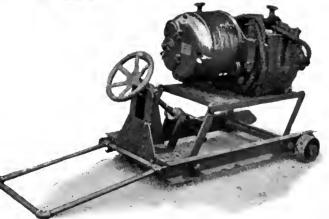
All electrical apparatus, except repaired railway motors, is tested here. The test panel in the background has a line breaker on it connected for test. Load resistors and protecting line breaker are overhead on the wall. A set is provided for testing aluminum cell lightning arresters.

Thermostatically-controlled babbitt pots make good bearings

Four gas-heated babbitt pots are installed in New Orleans, one for each composition of metal nsed. Babbitt temperatures are recorded continuously on a Leeds & Northrup potentiometer-type recorder. Bearings are cleaned in a hot Oakite solution, dried and placed in the furnace. When the babbitt melts out the shell is dipped in acid and cleaned. Then it is swabbed with zinc chloride solution and parts not to be tinned are painted with a clay mixture. The shell is tinned in half-and-half solder at 435-450 deg. C. After tinning it is placed on a mandrel and the babbitt poured from a self-skimming ladle.







A labor-saving device for removing and installing air compressors on the cars

This truck has a minimum platform height of $6\frac{1}{2}$ in. and a maximum height of $17\frac{1}{2}$ in. It is used only to facilitate removal or installation of compressors, which are carried through the shops by monorail and transfer cranes.



In the air-brake overhauling department

The test set at the end of the central bench tests valves of all types of air-brake equipment used on the cars. Another set recently installed is used for testing bus air-brake equipment.

is used to cut lumber to any desired length before it is trucked to the mill room.

The New Orleans mechanical department, likewise, has adopted modern practices and has made extensive use of machinery to reduce costs. Careful, periodic overhaul on a 40,000 car-mile basis has greatly reduced trouble and expense. The maintenance system is characterized first by the thoroughness of the overhauling and testing methods and second by the completeness of the records kept. These data are of great value as a check on all of the operations of the department. It is the writer's belief, based on a careful examination, that no other company has more complete data on its maintenance costs.

Some of the New Orleans practices that have contribnted to this result are shown.

In Memphis fewer cars are operated and there is not an equal opportunity to employ the periodic overhaul system. Inspection and car cleaning, however, are on substantially the same basis as on the other properties. Some of the best practices are illustrated.

The carpenter shop is completely equipped for turning out any car body parts. A Wysong Miles belt-type sand-papering machine is a great time-saver in smooth-finishing lumber. In the paint shop, which is adjacent to the carpenter shop, all cars are put through on approximately an eighteen-month basis. The paint shop also does the necessary painting on the power company's trucks and automobiles.

All cars are operated from a single carbouse adjacent to the shops. Inspection, oiling and cleaning of cars are done here, each inspector being responsible for certain cars assigned him. As the inspection discloses the need



Removing GE-268 armatures in Memphis

The motor is placed on the carriage, which can be moved longitudinally on a short track. The armature is suspended between centers, the pinion end housing is loosened and the carriage shifted. The armature is then lifted by a monorail air hoist and conveyed to any desired point in the shop.

for any major repairs to a car it is placed in the shops and given a thorough overhauling. Like the other three properties Memphis follows the practice of dipping and baking armatures and has developed improved methods of banding armatures, with the result that motor troubles have been reduced materially. Improvements in bearings and in lubrication practice have increased the life of armature bearings from 13,000 to 76,000 car-miles and of axle bearings from 40,000 to 225,000 car-miles.

In a previous article the writer pointed out that this group of companies has consistently purchased new cars and that during the period under consideration the average annual purchases have been twice as great as in the preceding years. Undoubtedly credit must be given the new equipment for much of the performance. Yet all the modern cars are completely equipped with air-operated doors, safety features and other auxiliary apparatus requiring maintenance, which the cars they replaced did not have. Furthermore, many of the new cars are of the double-truck, four-motor type, with 102 principal wearing parts, while quite a number of the cars they replaced were of the single-truck type with 29 wearing parts or the double-truck two-motor types with 56 wearing parts. In Atlanta in 1922 single-truck cars made 23 per cent of the total car mileage and double-truck, two-motor cars 45 per cent. In 1927 there were no single-truck cars and the double-truck two-motor car mileage had been reduced

to 23 per cent of the total. Furthermore, the average schedule speed has been increased from 9.2 m.p.h. in 1921 to 9.77 m.p.h. in 1927.

Then, too, it must not be forgotten that while new equipment becomes old equipment in a few years, the combined maintenance costs and car failures have gone down steadily on these properties.

Let us take one illustration to show how seriously these properties regard the matter of car performance. In April of this year the Edgewood carbouse in Atlanta operated 357,000 car-miles without a pull-in. It was a record for the property, extending from April 1 to 10 o'clock in the evening of the 30th. At that time lightning damaged two armatures. This performance was celebrated at a lunch given the carbouse men by the company. Among those present at the lunch were the principal officers and the division superintendents. Officers and department heads congratulated the carhouse organization on its record and expressed their appreciation of the team work, not only in the mechanical department but between that department and the transportation department, which had made possible such a high standard of service to the public.

FACTORS THAT HAVE BROUGHT SUCCESS

To sum up I am listing some of the factors which seem to me to have contributed to the performance achieved by these mechanical departments.

Interchange of cost and performance data through the



A corner in the Memphis forge shop

The equipment includes two forges, a trip hammer, a Kerlin bender, a case-hardening furnace, draft fan, anvils, crane and drill press. This shop serves both mechanical and way departments and also the power company's garage.

association. This, coupled with inspection trips and discussions at the association meetings, developed a spirit of competition and brought about a determination to improve past performance.

Efficient organization for the work to be done.

Competent, intelligent supervision.

Preventive maintenance policy based on thorough, periodic overhauling and systematic rigid inspection of equipment.

Improved shop methods and practices, and greater use

of machinery and special devices.

Good working conditions in shops and carhouses. Complete records of costs and performance.

Cleveland Railway Men

Win \$25 Maintenance Con

Organized participation in contest through the backing of management leads to large number of entries from Cleveland in track, overhead line and bus departments. The equipment department prize goes to San Diego for the second time. Contest enters final period and closes on July 15, both for third group of \$25 department prizes and the annual awards to be made at the A.E.R.A. convention in Atlantic City.

ESULTS of the interest aroused among the Cleveland Railway employees in going after the departmental prizes in Electric Rail-WAY JOURNAL Maintenance Contest, so as to qualify for the company trophy and departmental certificates of merit to be awarded at the annual convention in Atlantic City, were apparent at the last meeting of the committee of judges held recently in New York to decide the winners of the second group of departmental prizes. Of the four prizes given for the best items submitted from each department-equipment, track, overhead and bus-three were won by Cleveland men.

The prize for the way and structures department was won by Joseph Croyle, Cleveland Railway, for his "One-Man Tie Nipper" idea published in the April issue of ELECTRIC RAILWAY JOURNAL. Angus G. Scott of the Cleveland Railway received the prize in the electrical and line department for his "Pole Brushing Device" published elsewhere in this issue. The "Hinged Pit Cover" suggestion submitted by L. Rose, also of the Cleveland Railway, was awarded the prize in the bus and garage department. It also appears in this issue. In the department of rolling stock and shops the prize was awarded to Arthur E. Clegg, San Diego Electric Railway, for his "Method of Adjusting Brush Pressure" published in the April, 1929, issue of Electric Rail-WAY JOURNAL.

This is the first time in the history of the maintenance contest that more than one prize in any given period has been won by the men of a single company. Another interesting fact in connection with the prize winners during this particular period is that the equipment department prize, which is the only one not won by Cleveland, went to San Diego-the winner of the bus department prize during the first contest period.

Of the total number of forty-three items which were judged for this second period of the contest, the Cleveland Railway submitted a far larger number of entries in each of the three departments in which its men won prizes, than any other single company represented during this period of the contest. Obviously, Cleveland has made up its mind to capture the capital prizes to be awarded at the annual convention, which fall into three classifications:

ULY 15 is the closing date for submission of entries for the final group of departmental prizes in Elec-TRIC RAILWAY JOURNAL'S Mainte-nance Contest. Be sure to mail your maintenance article as soon as possible to Electric Railway Journal. Full details of the contest may be obtained by consulting the Oct. 20, 1928, issue of Electric Railway Journal. If this is not available, a folder giving this information, together with suggestions regarding the preparation of items for the contest, will be mailed you immediately upon request.

Attention is called to the fact that the closing date for all entries in the contest, including items to be judged for the individual cash capital prize, company trophy and departmental certificates of merit, has been changed from August 17, 1929, to July 15, 1929, All articles up to Living 15, 1929. All entries up to July 15, 1929, will be eligible for these annual awards, as well as for the remaining group of departmental cash prizes. Don't delay sending in your ideas. They may help your department and company to win one or more of the several annual awards that are to be made at the coming convention of the American Electric Railway Association at Atlantic City, N. J.

Standing of Companies and Departments in Maintenance Contest at Close of Second Period April 15,

Department

Сотрапу	Prizes		Wioners
Cleveland Ry	Track	2 {	F. E. Davidson Joseph Croyle
	Line Bus	1	Angus Scott L. Rose
	Total	4	
San Diego Elec- tric Ry	Bus Equipment	1	Charles Herms Arthur C. Clegg
	Total	2	
Toronto Transpor- tation Commis- sion.		1	L. H. McAdam
New York Central	Line	'	L. II. MCAdam
R.R. (electrified	Equipment	1	Harvey L. Bullock*

*Mr. Bullock is now electrical equipment superin-endent of the Cleveland Union Terminal, Cleveland,

viz., an individual capital prize of \$100 for the best single item submitted during the year, a company trophy and special departmental certificates of merit.

As outlined in the announcement of the maintenance contest which was published in full in the Oct. 20, 1928, issue of Electric Railway Jour-NAL, the company trophy will be awarded at the annual convention to the company making the greatest contribution to the improvement of maintenance practice in the industry through participation in this contest. In determining the winners, the judges will consider the total number of items submitted by employees or officials of a given company; the extent to which each of the four maintenance divisions are represented in the items submitted; the number of individual departmental prizes won; the relative merit of all material submitted; the extent to which the ideas presented are applicable to other properties; and the value to the industry of the maintenance ideas made available through participation of employees or officials in this contest.

The contest has now entered its

test Prizes in Three of Four

final stage and closes for the year on July 15. 1929. Winners of the four departmental prizes of \$25 each, during this final period, will probably have a strong bearing in determining the annual prize winners. It is not too late for organized participation from other companies in order to give Cleveland a close race for final honors.

JOSEPH CROYLE

M. R. CROYLE is not a newcomer in the electric railway field, having started in 1889 as a track foreman for the Johnson Steel Rail Company. In 1890 he was appointed an in-

Johnson Steel Rail Company. In 1890 he was appointed an inspector, taking charge of the construction of the street railway on Madison Avenue in New York City. Subsequently he was made "Flying Trouble Man" for the same concern in charge of various jobs in Washington, D. C., where track was to be rebuilt on North Capitol Street. From Washington he was sent as superintendent to numerous jobs in Pennsylvania and New Jersey, among them being the construction of 7 miles of track in Carbondale, Pa., in 1892.

In 1896 we find Mr. Croyle again in New York where for five years he was in charge of reconstruction work of the Metropolitan and Third Avenue Railways, and for three years he was in charge of the placing of structural steel for the erectors of the sub-

placing of structural steel for the erectors of the subway. In 1906 Mr. Croyle went to Memphis, Tenn., as superintendent of construction in charge of special track work for Ford, Bacon & Davis, and the following year he moved to Gary, Ind. In 1908 and 1909 he went to Little Rock, Ark., for the same firm, in charge of reconstruction. Next he was sent to Shreveport, La., to rebuild the street railway system there. From 1919 to 1922 Joseph Croyle was employed by the National Tube Company in Ohio, and in the latter year became connected with the Cleveland Railway

as track foreman, which position he holds today.

Mr. Croyle may well be considered a pioneer in track construction work, having seen the continual growth and expansion in this field since the start of electric railway operation in this country.

LEONARD ROSE

SINCE 1925 Leonard Rose has been with the Cleveland Railway as assistant superintendent of the motor coach department, in charge of maintenance. The experience which Mr. Rose had obtained previous to his connection with the Cleveland Railway provided a background to qualify him for his appointment as assistant superintendent there. He spent two years as service manager in the New York State district for the White Company, and came into this position after seven years of work company, and came into this position after seven years of work with the Packard Motor Company of New York, of which five were spent as technical service manager. The electric railway field was not new to him, as he worked a considerable period in the Morris Park shop of the Long Island Railway, where he was in charge of maintenance of shop electrical equipment. Soon after his graduation from the Pratt Institute School of Science and Technology, he was employed by the Brooklyn Edison Company as inspector of substation construction.

ANGUS G. SCOTT

URING 1924 Angus G. Scott joined the forces of the Cleveland Railway and, after having spent some time in the various departments he was appointed assistant superintendent of overhead lines, in which capacity he is engaged at the present time. He was awarded the prize in the electrical and line depart-



Maintenance Contest

ment for his article "Pole Brushing Device," which is an example of his aptitude for the application of labor-saving methods Previous to his employment with the Cleveland Railway he was affiliated with the Drew Electric & Manufacturing Company, being assigned, in 1922, to the sales department of railway supplies following his graduation from the Case School of Applied Science and Engineering.

ARTHUR E. CLEGG

FORMER prize winner in the Maintenance Contest, Mr. A Clegg is again a winner in the equipment department with a simple and accurate method of measuring brush pressure, the article on which was published in the April issue of ELECTRIC RAILWAY JOURNAL. Mr. Clegg is foreman in the electrical department of the San Diego Electric Railway, San Diego, Cal., where for more than four years he has been in charge of maintenance of control and motors, as well as the ignition equipment of buses. Considerable of his experience was gained while he was engineer of equipment in the mechanical department of the Indiana Service Corporation at Fort Wayne. Previous to that time he served for seven years with the Westinghouse Electric & Manufacturing Company, where he attended the Westinghouse Technical Night School and spent part of his time in the testing department and later in the engineering department as engineer on direct-current railway motor and control.

Handy Devices Used in Electric

How ingenious applications of up-to-date tools and methods are giving improved results at lower cost in various kinds of electric railway maintenance work

Pole Brushing Device Operated by Truck Engine*

By Angus G. Scott Assistant Superintendent of Overhead Lines Cleveland Railway, Cleveland, Ohio

Winner of electrical and line department prize in second group of entries in Maintenance Contest.

BRUSHING apparatus operated by a motor truck engine is used by the Cleveland Railway to remove corrosion from poles in service, as well as those which have been in service and are being reconditioned in the storage yard for future use. The previous method of hand cleaning, using a stiff wire brush, was inefficient and it was practically impossible, even under ideal conditions, to remove all of the corrosion before

paint was applied. The use of this new equipment results in a great saving of labor and in obtaining a thoroughly cleaned pole, thus permitting the proper adhesion of paint to metal and preventing electrolytic action which surely occurs beneath a surface covering of paint.

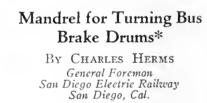
The brushing device consists of two 7-ft. sections of "Strand" flexible shafting operated by a special adapter which connects the shaft to the drive. The adapter is connected by a chain to a gear attached to the truck generator. A speed of 1,200 r.p.m. is given. Attached to the shaft is a stiff, circular wire brush of 10 in. diameter. Another section of shafting, if necessary, can be safely added to enable the crew to reach the upper sections of the pole. The

MAINT

special adapter was made and installed at a cost of \$30 and the shafting is sold by practically any supply concern.

Other devices, such as drills and grinders, may also be operated from the flexible shafting, making it a very handy tool.

With this device a man can clean a pole butt and all corrosion from the sections and places where attachments had been in one-quarter of the time it took by the hand method. The most severe corrosion, of course, occurs at the ground line and this can be cleaned out handily with the brushing wheel. After a coat of rust preventative is applied the pole butt is good for years of service, the need for sleeving it in a few years thus being avoided. The saving afforded by this device is measured in the added life of the poles, the longer life of paint applied and the labor saving in brushing the pole.



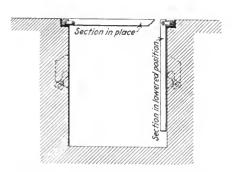
 ${
m B}^{
m RAKE}$ drums often become grooved to such an extent that the brakes will not perform properly. When solid cast-steel drums are worn 4 in, over standard size it is the practice of the San Diego Electric Railway, San Diego, Cal., to build them up by means of the electric arc and then to standard size. A 3-in. nickelsteel welding rod is used and care is taken by the welder to complete the job in one operation. This avoids excessive contraction stresses and eliminates hard spots which occur every time a bead is started on cold metal. The practice in our shops is to start the first bead very low on



Pole-brushing device receiving power from a motor truck engine is used by the line division of the Cleveland Railway

^{*}Submitted in Electric Railway Journal Prize Contest.

Railway and Bus ENANCE WORK



Hinged pit covers—a recent improvement in the garages of the Cleveland Railway

Standard timkin wheel bearings

Nut flattened for wrench,
Mount on lathe tail stock:

A

Y

Y

Y

Y

Y

Y

Y

Y

S53"

S33"

Mandrel used for turning bus brake drums

the outside edge of the drum where a smooth finish is not essential. For turning we have found that Blue Chip Rex triple "A" tool steel makes an excellent turning tool.

Our first attempts at turning brake drums was not very satisfactory. We mounted the drums on the wheel spiders and chucked the spider in a lathe. We found it difficult to turn the drum true with the wheel bearings, consequently we developed a self-centering mandrel which centers the drum automatically to the wheel bearings. On our equipment standard Timken wheel bearings are used as guide cones which fit the bearing cups in the spider. The cones are held rigidly in place by means of the nut indicated as B on the accompanying sketch. The taper C fits into the lathe center. The mandrel revolves with the drum and there is no strain on the mandrel other than that of holding the drum true with the wheel bearings while the lathe chuck jaws are screwed down on the wheel spider. The drum is thus driven by the spider, and the mandrel merely revolves with the drum. This method gives absolutely true turning, and the time required for the operation is very short. The same mandrel may be used on various sizes and styles of drums by making special steel cones instead of using the Timken cones.

We find that we can build up and turn a drum at a cost of 40 per cent less than the price of a new drum. Some drums have been built up repeatedly and it has proved entirely

successful. It is advisable to make the final finish on the drum with an internal grinder mounted on the lathe tool post carriage to remove tool marks and give a smooth surface.

Hinged Pit Covers

By L. Rose

Assistant Superintendent Cleveland Railway Cleveland, Ohio

Winner of bus and garage department prize in second group of entries in Maintenance Contest,

In DESIGNING a pit for a new garage of the Cleveland Railway the problem arose of obtaining suitable covers for an inspection pit 96 ft. long. The ideal pit cover is one which is light, strong and accessible at all times, without being in the way. Curbs were not desired because of the length of the pit and because it is necessary occasionally to break the line of progress of the coaches and remove a coach before it reaches the end of the pit.

TWO of the four prize winners in the second group of departmental awards in Electric Railway Journal's Maintenance Contest are printed on these pages. Look up the winning items for the rolling stock and the track departments which were published in the April, 1929, issue. These were "Method of Adjusting Brush Pressure" on page 544 and "One Man Tie Nipper" on page 550. They are widely applicable to railway maintenance and are well worth adopting and using.

To meet the needs of this situation a toggle linkage was designed, as indicated on the accompanying illustration. By using this linkage and hanging three 1-ft. sections of pit cover on alternate sides of the pit, opposite the light recesses, a pit covering was obtained which meets all the requirements. In this installation the covers were of a conventional type of subway grating. The toggle linkage was supplied by the manufacturer of the grating, and the supporting angle brackets were arc-welded onto the curb angles forming the top of the pit. The grating was properly drilled at the factory so that the assembly was simplicity itself.

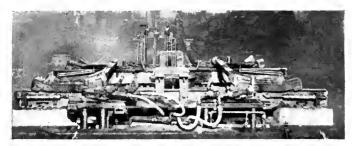
The hinged or toggle end is lifted up and back until the "drop" end clears the curb angle. The cover is then lowered until it hangs in place on the toggles, as shown. By properly proportioning the linkage and locating the screws, the covers will hang close to the wall and flush with the floor.

While the initial cost of this installation is somewhat more than that of a conventional type the advantages ontweigh the cost when appearance, convenience and the savings of time and labor are considered.

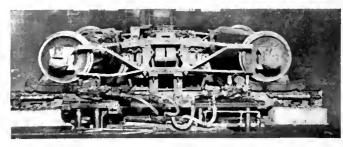
Pneumatic Jig for Truck Assembly*

By Charles Devers
Supervisor of Methods
Pittsburgh Railways, Pittsburgh, Pa.

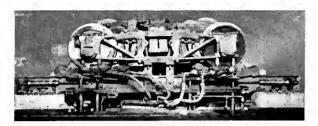
Line production methods are used for all work on truck maintenance in the Homewood shops of the Pittsburgh Railways. When this plan was first introduced it was a radical departure from any established precedent, and naturally there arose quite a number of serious problems. One of those which had to be solved concerned the work necessary for final truck assembly. After much study a pneumatic jig was con-



Truck assembly jig before any parts have been placed in position



Truck, frame resting on center supports. The bolsters and springs are in position while the wheels and motors rest on the carriages at the end of the truck frame



Here the wheels and motors are in position and the pneumatic wrenches are tightening the journal box bolts

structed which performs most of the assembling operations and so lightens the work that two men can do the entire job.

In this work the truck frame is the first unit put upon the jig. The frame is held in alignment by two small pieces of channel iron, one on each side at the center. The next operation is the placing of the wheels and motors in position. Four pneumatically operated carriages receive the wheels and move them and the motors into their proper position. Bolster springs and bolsters are then placed in position. The springs are compressed by use of two 12-in. air cylinders, which are fastened underneath the jig. After the springs have been compressed the bolster tie straps are tightened up. Eight pneumatic wrenches are permanently installed underneath the journal box bolts.

wrenches are raised into position by air cylinders and tighten the eight journal box bolts simultaneously.

Through the use of this jig two men carry out the entire work of truck assembly. They install wheels, motors, bolsters and springs to eighteen trucks, each

working day of eight hours. The installation of this jig in the shop has effected a considerable saving in both time and labor.

Costs Cut by Use of High Pressure Grease System*

By C. B. HALL

Chief Clerk Mechanical Department Virginia Electric & Power Company, Norfolk, Va.

VITH the addition of two "Dot" electrical lubricators to the equipment of the bus department of the Virginia Electric & Power Company, a saving in time and labor of 50 per cent has resulted. Operation of the new high pressure system is managed by one man in

*Submitted in Electric Railway Jour-NAL Prize Contest.

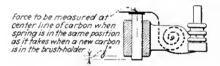
approximately one-half the time required previously when a hand operated two-man gun was used. The new equipment cost \$195 and is arranged for 110-volt, 60-cycle a.c. operation.

Brush Tension for Railway Motor Brush-Holders

By R. N. Cresswell

Engineering Department Westinghouse Electric & Manufacturing Company Homewood Works

ORE care is being used today to apply the proper tension to carbon brushes than was exercised several years ago. This has resulted in the use of higher tension, since better results are obtained. It is not possible to get good results by applying the same tension on brushes that is used under different operating conditions. For this reason any tension



Brush and brush-holder, showing point where force of fingers should be measured

that may be recommended might not prove satisfactory for all cases. However, a tension of 6 to 8 lb. per finger has proved satisfactory on brushholders that use more than one finger. On brush-holders that only have one finger per holder, a tension of 10 to 12 lb. per finger should be used. In some exceptional cases it may be necessary to increase these tensions 50 per cent. It is best that the tensions be applied to the brush-holders when they are in the shop. In this way a more uniform tension may be applied as it is easier to get a more accurate measurement. The tension should be taken from a point at the center of the contact surface on the finger. This should be done when the contact surface of the finger is in a horizontal position, or the position it should be in when used on a new



Lubricating a White bus with new electrical lubricator

Useful Equipment

from the

Light-Weight Concrete Breaker

THE Sullivan Machinery Company has recently put on the market a new concrete breaker known as the "K-2 Buster." Its weight is com-

The "K-2" concrete breaker has a push-type I e v er throttle valve and U-type side rods acting as equalizers

paratively low, only 76 lb., yet it is strong and easy to handle, while vibration is kept to a minimum, thus decreasing the fatigue of the operator. The K-2 uses any of the regular

forms of tools made of hexagon steel, with plain hexagonal shanks. It requires $\frac{3}{4}$ -in, air hose, is entirely newly designed and has a cylinder turned and bored from a solid bar of alloy steel with a simple,

Manufacturer

free-floating piston of tool steel. The drop forge handle incloses the valve mechanism while the valve is of the hollow shell, cylindrical model, inclosed in a valve box with cover.

Mortar Flow Pulsator

THE mortar flow principle in track construction is that after the concreting of the modern steel tie type of track structure, the whole should be so moved in the wet concrete as to cause a flow of the mortar and complete contact and bond wherever the steel of the track structure touches concrete. This movement must be very slight, but rapid.

A device recently developed by the International Steel Tie Company is called the Mortar Flow Pulsator and is furnished attached to the compression tamping machine as shown in the illustration. It is driven by a 2-hp. 550-volt motor and is controlled and operated on the job by the operator of the compression tamping machine.

The device imparts 4,800 impulses

per minute to the whole track structure following the compression tamping operation and practically unites all the steel with concrete. Rows of air bubbles can be observed coming up along the rail, indicating the displacement of small air pockets as the mortar comes into close contact and bond with the steel.

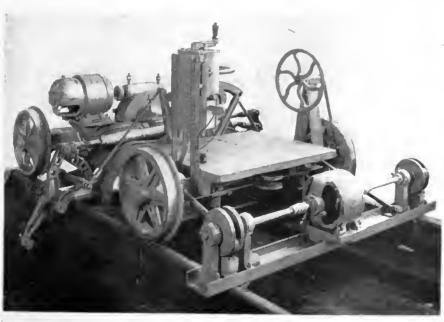
Portable Dynamic Balancing Equipment

BY MEANS of the stroboscopic principle, apparatus known as the Davey Dynamic Balancing Equipment, which weighs only 20 lb., can be used for determining separately the static and dynamic unbalance existing in machines ranging in size from turbines down to fractional-horsepower motors and correcting both types of unbalance in turn. The apparatus is being manufactured by the Electrocon Corporation, New York, N. Y. In an accompanying illustration are shown the three parts: the hand lamp, which contains a special neon tube,



Davey dynamic balancing equipment removed from the case. From left to right the parts are: hand neon lamp, phase adjuster, and "Vibrometer"

is at the left, the phase adjuster is in the center, and the Davey "Vibrometer" is at the right. The equipment can be used where it is advisable to balance a rotor running under its own power, where it is advisable to balance at a speed higher than that of the available balancing machine, or where a rotor has become unbalanced in service, but it is inadvisable to dismantle the machine. It is also



The mortar flow pulsator with the protective guards removed to show the details



Davey dynamic balancing equipment set up on a motor to determine the static and dynamic unbalance

applicable to production balancing before assembly.

In another illustration is shown a set-up for testing the unbalance of an electric motor and determining the position and amount of the resulting vibration. When the rotor is illuminated by light flashes from the neon hand lamp it appears stationary, no matter what its speed. The phaseadjuster head is attached to the shaft or driven by the shaft the same as a tachometer. The phase adjuster in the head regulates the light flashes so that rotor will appear stationary at any desired point. The Vibrometer arm is placed in contact with the machine frame at any point, and indicates not only the amount of vibration, but also the position of the frame in its path of vibration with respect to the rotor in the latter's revolution.

The vibrations of the machine, transmitted through the arm of the Vibrometer, cause a small mirror within the instrument to oscillate. Light from an incandescent lamp is thrown on the mirror, and is then reflected on to a scale magnified several hundred times. The scale is graduated in thousandths. Red light from a neon lamp, which is also controlled by the head, is also thrown on the screen and impinges on the band of white light. As the phase adjuster is turned, the red band from the neon lamp will assume different positions along the band of light. When it is at the extreme right, it indicates that the motion of the machine is towards the Vibrometer. Thus it is possible to determine the exact position of the machine in its path of vibration, and to establish the connection between this and the position of the rotor, it is only necessary to light the hand lamp. Thus the high spot can be determined accurately.

New Body Designed for Mack Buses

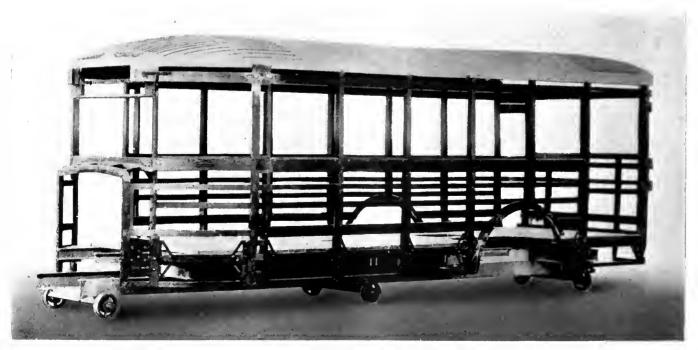
AMONG the characteristics of a new bus body recently developed by Mack is the integral skirt of unit parts construction, the units of which are replaceable from stock in all Mack factory branches. The rub rail has been eliminated and the doors are equipped with concealed door hinges and smooth panels, while improved destination signs and new types of ventilators are incorporated on the new bodies. Spare tires are



All joints are mortised and tenoned, screwed, glued and reinforced by pressedsteel angle plates and braces

carried beneath the chassis instead of the rear, allowing for greater overhang without increasing over-all dimensions. The cowl has been considerably shortened and the steering column is placed outside the frame and well forward, thus placing the driver in the left forecorner of the body, consequently making more room available for the use of standing passengers.

The ceiling of the new body is smooth, while the aisle space is kept large to promote convenience for standees during rush hours. The bodies are built to accommodate from 29 to 37 passengers and the width is 96 in., thus insuring the maximum comfort to passengers. To increase smooth riding rubber shock insulators are used extensively at all points of spring suspension.



New Mack body is built up on steel structural sills; posts are secured by through bolts to malleable-iron gussets not riveted to sills

NEWS of the Industry

Utilities Render Aid in Cleveland Disaster

Cleveland utility companies gave a marvelous demonstration of speed and efficiency in a great emergency when explosion and fire, shortly before noon of May 15, transformed the model Cleveland Clinic into a death chamber for some 125 doctors. nurses and patients who were struck down

by deadly poisonous fumes.

A line crew of the Cleveland Railway, in the vicinity at the time, reached the scene simultaneously with the first fire department equipment while yellow fumes were still belching from shattered windows and skylights. Members of the line crew helped rescue some of the victims and attempted to revive others whose bodies were carried out by firemen. The offices of the railway, notified immediately, sent doctors and nurses to the scene, while bus crews were mobilized to provide emergency service on Euclid Avenue during a three-hour period in which the railway service was blocked. Linemen from the Ohio Bell Telephone Company established emergency telephone service on a post in the Clinic yard twenty minutes after the blast.

Traffic Study Suggested in Houston

The average speed of street cars in downtown Houston, Tex., is 3½ m.p.h., and that of automobiles a scant one-half mile better in heavy traffic, Carl Frazer, of the Houston Electric Company, informed members of a suburb improvement club.

Merchants of the Texas city insist that

much patronage comes from automobiles parked near their stores. Pressure from them on the city administration has blocked efforts to abolish the 45-degree angle

Mr. Frazer recommends a study of the factors responsible for traffic snarls. Speed of both street cars and automobiles through congested sections could be hiked 100 per cent with intelligent regulation, he believes.

lieves.

The Texas city has traffic control lights which operate on a "ripple system," calculated to allow vehicles to proceed uninterrupted at 10 m.p.h. In actual practice, Mr. Frazer points out, the automobilist is forced to stop at each intersection. "The forced to stop at each intersection. ripple system is really an obstacle to traffic," he declared.

Another New York City Fare Plea Disallowed

The New York Transit Commission on May 21 rejected as illegal the 7-cent fare tariff sheets filed on June 22, 1928, by the Drydock, East Broadway & Battery Railroad, one of the Third Avenue Railway Company's subsidiary surface car lines. Chairman William G. Fullen declared that the question of "reasonable return" raised by the company had no bearing because the 5-cent fare was "contractual in nature" due to the form of franchise grant made by

the Legislature in 1860 and subsequent

Chairman Fullen questioned whether a higher fare would remedy conditions. The falling off in traffic, in his opinion, "is apfalling off in traffic, in his opinion, parently due in large part to the slowing down of its operation as a result of the interference of increasing vehicular traffic in some of the narrower streets of lower Manhattan and to the existence and advent of competing lines with shorter running time and the same fare."

Counsel for the company said the case would be taken to the courts.

Midwest Men Meet June 13-15

The annual meeting of the Midwest Electric Railway Association will be held at the Chase Hotel, St. Louis, Missouri,

June 13, 14 and 15.

The Midwest Claims Association will meet at the same time and place. On June

14 a joint meeting will be held.

Entertainment is in charge of Barney
Frauenthal of the St. Louis Public Service Company, operating both railway and bus lines in St. Louis. Details of the program will he announced later.

Prosperity a Delicate Economic Balance

Committee on Recent Economic Changes Says the Country Must Skillfully Apply the Principle of Equilibrium in **Every Economic Relation**

WHILE America has a promising fu-ture, the outstanding fact illuminated by the survey made by President Hoover's Committee on Recent Economic Changes is that the country cannot maintain its economic advantage or hope fully to realize on its economic future unless it consciously accepts the principal of equilibrium and applies it skillfully in every economic relation.

The committee notes that while the period 1922-1929 has been one of intense activity, conditions have remained spotty, from industry to industry and from region to region. Despite this spottiness, however, armost the total people have been hettered Despite this spottiness, however, alin their situation by the increasing productivity.

STANDARD OF LIVING IS RISING

While rayon manufacturers have worked at top speed, cotton mills have been on part time; while the silk hosiery industry, the women's shoe trade and the fur business have been active, there has been depression in the woolen and worsted industry; while dairying has been prosperous, grain brokers have been depressed. Coal mining has been in difficulties, and classes of wholesalers and retailers have been under grave eco-Progress has been made nomic pressure. toward more stable employment in seasonal industries, yet "technological" unemploy-ment, resulting from displacement of workers by improved machine methods, has attracted attention. machinery

Geographical differences also were noted. The Pacific States have made an extraordinary advance; the South has rapidly developed as a manufacturing area; the East North-Central division has grown; while the New England states and, to some extent, the Middle Atlantic section, have developed less rapidly and have experienced some difficulties in adapting their older in-

dustries to new conditions.

In spite of variability, of difference in activity as between groups and areas and industries, the rising standard of living characteristic of this period was widespread and has reached the highest level in the national history of these United States.

In speaking of saturation points of production, the report states:

"The survey has proved conclusively what has long been held theoretically to be true, that wants are almost insatiable; that one want satisfied makes way for another. The conclusion is that economically we have a boundless field before us; that there are new wants which will make way endlessly for newer wants, as fast as they are satisfied.

"We have the power to produce and the capital to bring about exchange between the producing and consuming groups. We the producing and consuming groups. We have communication to speed and spread the influence of ideas. We have swift and dependable transportation. We have an educational system which is steadily raising standards and improving tastes. We have the sciences and arts to help us. We

have a great national opportunity.
"We seem only to have touched the fringe of our potentialities."

As the committee sees it, to maintain the dynamic equilibrium of recent years is, indeed, a problem of leadership which more and more demands deliberate public at-tention and control. Research and study, the orderly classification of knowledge, joined to increasing skill, well may make complete control of the economic system a possibility. The problems are many and difficult, but the degree of progress in re-The problems are many and cent years inspires us with high hopes. The committee says:

"In the marked balance of consumption and production, for example, the control of the economic organism is increasingly evident. With the development of a stream of credit to facilitate business operations, and with flexible power to energize industry and to increase the effectiveness of the workers, has come an increasing evenness in the flow of production. Once an intermittent starting and stopping of production-consumption was characteristic of the economic situation. It was jerky and unpredictable, and overproduction was followed by a pause for consumption to catch up. For the seven years under survey, a more marked balance of production-consumption is evident.

"To maintain this balance, and to extend it into fields not now in balance with the

more prosperous elements of the nation, is clearly an important problem of leadership. With certain natural resources still wastefully exploited, with great industries such as agriculture and coal mining still below the general level of prosperity, with certain regions retarded, there remains much to do. To bring these more fully into the stream of successful forces is a problem of the

"Our complex and intricate economic machine can produce, but to keep it producing continuously it must be maintained in balance. During the past few years equilibrium has been fairly well maintained. We have not wasted the hours of labor by strikes or lockouts. Until recently we have not diverted savings from productive business to speculation. There has been balance between the economic forces—not perfect balance, but a degree of balance which has enabled the intricate machine to produce and to serve our people."

Cleveland Men Restive

The Cleveland Railway, Cleveland, Ohio, has declined to sign a contract with Division 268 of the Amalgamated. At a special meeting of the union on May 17 a motion was offered to walk out at midnight on May 19 if no agreement had been signed by that time. This motion was hotly debated, and a substitute motion finally was adopted instructing officers of the union to make one more effort to obtain a contract. If this fails another special meeting will be called, probably for the purpose of authorizing a strike vote.

Union officials say they do not want a closed shop contract, which was outlawed by the Supreme Court in the 1924 controversy, but will be satisfied with an open shop contract. The agitation for a contract is especially acute this year because of the probable acquisition of control over of the probable acquisition of control over the company by Van Sweringen interests. The men state that they want assurance that they will be protected in their wages and work in the event of a change in control. They are also concerned about the substitution of buses for street cars on some

Action Expected on Chicago Unification Bills

Action is expected on a number of utility bills before the Illinois General Assembly at Springfield adjourns sine die, probably early in June.

The bill is still in committee which requires a public utility that makes use of streets or alleys to obtain a franchise or license from the city in addition to a certificate of public convenience and necessity from the State Commerce Commission.

The eight Chicago traction bills, which have passed the House, are in Senate committee on utilities. It is expected an effort will be made to amend the bills so the terminal permit will not apply to downstate. Such amendment was killed in the House committee and on the floor and it is believed it will be killed by the Senate, if offered.

On May 21, the Senate passed, without opposition, a bill which removes from the Public Utility Act the provisions for appointment, term of office and salary of the secretary of the Illinois Commerce Commission and leaves such provisions under

the Administrative code.

According to a House bill on third reading in that branch, the Illinois Commerce Commission shall not authorize any public

utility to acquire land by eminent domain until the persons having an interest in the land are notified of the hearing. Committee on public utility and transportation had previously recommended that it do not

Dr. McClintock to Survey Kansas City Traffic

A traffic survey of Kansas City, Mo., is being arranged to start June 15, under the direction of Dr. Miller McClintock.

The idea originated with the Chamber of Commerce and a committee known as the city wide traffic committee was named representing the chamber, the city, the Kansas City Public Service Company and other public utilities, and various associations of merchants and business men.

Theodore M. Matson will be chief engineer of the project, and the resident representative of Dr. McClintock.

Until now the regulation of traffic in Kansas City and legislation concerning it have been a hit-and-miss matter.

Parking Ban Successful in St. Louis

The ninety-day trial period of the noparking rule for Washington Avenue, Olive and Locust Streets, St. Louis, Mo., proved so helpful to the movement of strect cars, buses and other vehicular traffic through the downtown section, Director of Streets and Sewers Brooks has presented to the Board of Aldermen a bill to make the regulation permanent. The trial ordinance was passed last February and the ninetyday period expired on May 16. Director Brooks has also started a movement to eliminate all parking in alleys in the congested districts of the city.

Excellent Business and Social Program for C.E.R.A.

Two morning business sessions will be held at the summer meeting of the Central Electric Railway Association, at the Golfmore Hotel, Grand Beach, Mich., June 27 and 28. The program for these sessions follows:

"City Fares and Municipal Growth," by

"City Fares and Municipal Growth," by Walter Jackson, fare consultant, Mount Vernon, N. Y.
"Type of Bus Best Suited for City Transportation," by Del A. Smith, general manager of the Department of Street Railways, Detroit, Mich.

"Bus Policies of an Electric Railway Company," by Thomas Fitzgerald, vice-president of the Pittsburgh Railways, Pittsburgh, Pa.

"Effect of Flat Rate Taxicab Operation on the Revenue of Street Railways and Metered Cab Operations," by H. A. Innes-

Brown, editor Taxi Weekly.

"Improved Interurban Operation," by J. R. Blackhall, general manager of the Chicago, North Shore & Milwankee Rail-

road, Highwood, Ill.

Report of "Promotion of More Profitable Business Committee," by D. R. able Business Committee," by D. R. Thomas, president Electric Railways Freight Company, followed by prepared discussions on freight and passenger scrvice.

Elaborate arrangements have been made for entertainment, including golf, tennis, bathing, bridge and a sight-seeing tour of Chicago for the ladies. An informal dinner dance will be held Thursday evening for members and guests of the association.

COMING MEETINGS

June 3-6—National Association of Purchasing Agents, annual conven-tion, Hotel Statler, Buffalo, N. Y.

June 5-7—Canadian Electric Railway Association, annual convention, Montreal, Quebec.

June 18-15—Midwest Electric Railway Association, Hotel Chase, St. Louis, Mo.

June 21-22—New York Electric Railway Association, Bluff Point, N. Y.

June 27-28—Central Electric Railway Association, Michigan City, Ind.
July 1-2—National Motor Bus Division, American Automobile Association, annual meeting, Hotel Lafayette, Buffalo, N. Y.

July 24-26—Electric Railway Association of Equipment Men, Southern Properties, Lafayette Hotel, Lexing-

July 26-27—Central Electric Railway Accountants' Association, Angola, Ind.

Aug. 15-16—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis. Aug. 27—National Association of Railroad and Utilities Commissioners, Glacier National Park, Mont.

Sept. 28 - Oct. 4 — American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium.

Terminal Opening at Cleveland May Be Delayed

The opening of the Cleveland Union Terminal, scheduled for Jan. 1, 1930, prob-ably will be delayed several months as a result of an injunction issued in Cleveland by Federal Judge Paul Jones restraining the Cleveland Union Terminals Company from entering upon the property of the Wheeling & Lake Erie unless or until the Interstate Commerce Commission authorizes the Wheeling to enter the terminal.

The injunction grew out of a fight between the Taplin interests of Cleveland and the Van Sweringens for control of the Wheeling. The Wheeling directors have voted to accept a contract offered by the Van Sweringen interests to enter the ter-Van Sweringen interests to enter the terminal for a rental of \$20,000 annually and to sell the Wheeling property, claimed to be worth \$6,000,000 for \$1,600,000.

Since the Wheeling property lies at a

strategic point at the east approach to the terminal, the entrance to the terminal will be blocked unless the Van Sweringen interests can acquire it. As a consequence of the injunction a considerable part of the work on the terminal development is at a standstill, and the date for completion of rapid transit lines, effecting the future of the Cleveland Railway, is uncertain.

City Manager Hopkins of Cleveland ap-

peared as a volunteer witness before the commission to urge that the Van Sweringen projects be completed as soon as possible to prevent injury to business.

New Magazine for Stark Electric

"King Accident," an article showing how safety pays employees of the Stark Electric Railroad, Alliance, Ohio, appears in the first issue of "Trip Topics," a magazine, published by the Suburban Light & Power Company covering to provide a william. The Company covering its various utilities. The author is O. K. Ayers, vice-president of the Stark Electric. "Trip Topics," the name of the new magazine, is an anagram derived from the first letter of each class of utility owned by the Suburban-telephone, railroad, ice and power.

Commission Measure Fails in Texas

In the final vote of the Senate Committee on State Affairs a bill creating a public utilities commission for the State of Texas was reported adversely by a majority of the committee. The House also has acted unfavorably on the bill. Governor Moody submitted the subject at the recent regular session and at the present special session. Another special session will be called in June, primarily to pass appropriation bills and it is reported that Governor Moody will again urge the public utility measure.

Special Service for Women Workers on Night Shift

The Community Traction Company, Toledo, Ohio, has come to the aid of some of the important manufacturing concerns by furnishing them special service. Recently an arrangement was made with the Electric Auto-Lite Company to take women workers going off duty at 3 a.m. to their homes by special coach service. This was the only method by which the plant could secure sufficient help for that shift. Special school lines, some serving railroad yards in outlying districts, and owl service are now being provided by motor coach.

Founding of Gary System Celebrated

The twenty-first anniversary of the birth-day of the Gary Railway, Gary, Ind., was celebrated recently with a gala "Parade of Progress" and by a banquet of "old time" trainmen and officials. A street car parade of seven cars, represented the various stages of the company's development, was headed by the city's first electric car, old "101." At that time there were only about 3 miles of track, whereas today the company operates more than 76 miles of track. The novel procession traveled over the entire city system, making two round trips each day. An "Old Timers" banquet was held on May 20, at the Hotel Gary, many veterans of the system telling of experiences in the early days. Gary has a population of 115,000 today. The city was two years old when railway service was started.

"Ad" Copy Contest Won by Jacksonville Company

First award in an advertising contest during 1928 among Stone & Webster, Inc., railways and bus companies has been made to the Jacksonville Traction Company. The award was made on a point basis, compiled from monthly reports by the competing companies. At the end of the year, which closed March 31, totals showed that the Jacksonville Company had 970 points, a three-point margin ahead of the Northern Texas Traction Company at Fort Worth, Tex. Thirteen other companies competed.

Triction Company at Fort Worth, 1ex. Thirteen other companies competed. Each month's report was graded on a basis of a possible 100 points. Of these 45 were for excellence of copy; 40 for layout and art work, and 15 for typography. During the entire twelve months the Jacksonville Company figured among the first three companies each month.

With 970 points out of a possible of 1,200 for the year, the work of Herbert Bayer, advertising manager of the Jacksonville Traction Company, was far ahead of all other competitors with the

exception of the Northern Texas Traction Company. The Savannah Electric & Power Company was third with 783 points.

A distinctive feature of Mr. Bayer's work was the tie-up with stores and theatres, by which reciprocal store and railway advertising stunts were executed.

Historic Virginia on the Screen

Scheduled for production on the screen June 1, the Virginia Electric & Power Company is now producing a commercial and historical film, "For the Old Dominion," to be shown in every moving picture theatre in the territory served by the company

by the company.

The "shots" are being made by the Visngraphic Pictures, Inc. They will include the thriving seaport city of Norfolk, with its atmosphere of charm and modernism; Richmond, with its Capitol Square, the Washington Monument and classic building associated with the birth of the American nation and the Civil War period; Jamestown, where the first



Ready to shoot "For the Old Dominion"

permanent English colony in America was founded; the territory in which the romantic story of Pocahontas and John Smith was enacted; Yorktown at which the closing scene of the Revolutionary War was staged; Williamsburg, the first capital of Virginia and seat of the second oldest college in the country and where today John D. Rockefeller, Jr., is expending millions to recreate the historic buildings of that quaint colonial city. In addition, many other historic points will be woven into the story of the awakening of Virginia.

The industrial aspects of the film will

The industrial aspects of the film will include scenes in tobacco factories of Richmond; its ice, paper and baking industries, and the rayon plant now in operation in the territory adjacent to the Richmond territory. Similar industries in Norfolk, Portsmouth, Suffolk and Petersburg will be filmed.

Petersburg will be filmed.
Film studies also will be made of the sources of great electrical energy owned by the company in Norfolk, Frederickburg, Richmond and Roanoke Rapids.

Officials of the power company say the film is produced for no other purpose than to show the "come-back" staged in Virginia within the past few years. The historical scenes are expected to add greatly to the message of the picture.

ringina within the past lew years. The historical scenes are expected to add greatly to the message of the picture.

The picture is being filmed under the direction of A. H. Herrmann, director of publicity for the company.

Fare Request in Louisville Rejected

The lower board of the General Council of Louisville, Ky., at a regular meeting on May 21 rejected a proposed bill introduced last February, and calling for a 10-cent cash fare by the Louisville Railway with the privilege of issuing tickets at a reduced rate.

After this bill had been killed the Council passed a substitute bill drawn by Mayor William B. Harrison which would continue the present 7-cent fare and value company property at \$18,000,000, on which a rate of return of 6 per cent would be allowed. There was no opposition vote on either measure.

The Council also authorized the city to employ William Marshall Bullitt, prominent local attorney, to represent the city in handling any railway litigation, apparently deemed inevitable under the circumstances. No opposition was raised to this latter action, although it was reported that the Taxpayers League, had instructed one of its delegates to the meeting to protest against Mr. Bullitt's retention.

June 30 Filing Date for Coffin Briefs

June 30, not July 15, is the final date for the filing of briefs by entrants from the electric railway field in the Coffin Foundation prize award contest. The incorrect date was inadvertently given in the item in the Journal for May 11 in which the announcement was made that Canadian companies were free to compete for the award.

Wage Negotiations at Providence—Members of the union at Providence, R. I., after hearing the terms of the contract submitted by Alonzo R. Williams, general manager of the United Electric Railways, as a substitute for the agreement under which the union men are now working, voted unanimously to reject the company proposals. They also instructed the union officers to open negotiations with the company for a continuation of the present contract with certain wage rate increases and other specified changes. The agreement expires on May 31.

Special Service for St. Louis—A morning and evening express railway service between Kirkwood, Mo., and downtown St. Louis, reducing the running time twelve minutes has been installed by the St. Louis Public Service Company. The run from Kirkwood to Fourth and Market Streets, St. Louis, is made in 63 minutes. Regular rates are charged, the entire trip requiring two fares or 16 cents. Both fares are collected as the passenger enters the car. Arriving at St. Louis, passengers are discharged at any city stop, while outbound passengers for Webster Groves or Kirkwood are picked up at any city stop.

School Fare to Continue Throughout Vacation Period—All school children under sixteen years of age will be able to go on using school tokens on the cars and buses of the Seattle Municipal Railway, Seattle, Wash., after school is out for the summer, paying their way to parks, playgrounds and bathing beaches with them, under an ordinance approved by Mayor Edwards. The ordinance was backed by George B. Avery, superintendent of utilities. It passed the Council without opposition.

Right-of-Way Bought—The Oregon Electric Railway has purchased property near Lebanon, Ore., adjoining the Southern Pacific tracks which is to be followed by further purchases along the line of survey recently made for an electric logging road from Lebanon to Foster.

Labor Favors Fare Advance—Central Labor Council at Portland, Ore., has unanimously indorsed the petition of the Portland Electric Power Company now pending before the Public Service Commission for an increase from an 8 to a 10-cent farc.

Reading Awards First of Electrification Contracts — The first tangible step in the Reading Railroad's \$20,000,000 electrification program at Philadelphia has been taken by the awarding of a contract for 4,000 tons of steel for catenary supporting structures and signal bridges to the Bethlehem Steel Company.

Terminable Permit Bill Passed — The Missouri Senate on May 15 passed the bill authorizing St. Louis to grant terminable permits to public utilities.

Electrification Predicted—The eventual electrification of the Oregon-Washington Railway & Navigation lines is predicted in a newspaper report from Lewiston, Idaho.

Wage Agreement in Davenport Renewed—The Tri-City Railway, Davenport, Iowa, has executed contracts with its trainmen, bus operators and shop employees for the year beginning May 31, 1929, continuing the present wage scales.

Louisville Railway Broadcasting— The Louisville Railway, Louisville, Ky., has gone on the air over WHAS, the station of the Louisville Courier Journal and Louisville Times. It is planned to have programs each Thursday, starting at 8:30 in the evening, Central Standard Time.

Lake Burien Plea Renewed—The city of Seattle, Wash., has asked the Department of Public Works to refuse to grant the application of the Suburban Transportation Company for an extension of its route to compete with the Lake Burien railway, now a part of the Seattle municipal system, or authorize the city to abandon this branch. On April 10 the department refused to grant a similar request to discontinue the Lake Burien line.

A City Planning Move—The City Planning Commission of Portland, Ore., has suggested that the Southern Pacific Railway vacate Fourth Street, along which its Red Electric trains now operate, and that they arrange to use the tracks of the Oregon Electric Railway. This is to clear Fourth Street for use as a main traffic thoroughfare even before action can be taken on the municipal belt line terminal under which all trains, both electric and steam, will be removed to the water front district.

Facilities Expanded—Rates Reduced—Noon express freight and a reduction of almost 10 per cent in livestock rates have been announced by the Indianapolis & Southeastern Railroad as a result of increased business between Indianapolis and Connersville and Greensburg. The railroad has been authorized by the

Public Service Commission to give motor freight transportation service between Greensburg and Batesville, Ind., serving Napoleon, Osgood, Versailles and New Point.

Membership Drive Makes Record—Chicago Elevated Post No. 184, recent winner of the American Legion Certificate of Meritorious Service, continues to set a fast pace in the 1929 membership drive. The latest report shows that 693 veterans have been enrolled in "L" Post this year. This is almost a 300 per cent

increase over the total number of veterans enrolled in 1928. This remarkable record was celebrated on the evening of May 7 with an "Open House Night."

Franchise Vote on June 18.—June 18 has been fixed as the day on which the proposed 30-year franchise for the Jacksonville Traction Company will go before the electors. The proposed new operating grant has been passed by the City Council and approved by the company. Substitution of buses for street car service on certain lines is proposed.

Foreign Notes

Bus Anniversary Celebration in London

For the first time in history, July 4 is to be celebrated in London, England, this year. That date will mark the hundreth anniversary of the London bus. Shillibeer, a coach-builder and ex-midshipman of the Royal Navy, started the system with two horse buses which he operated between Paddington and the Bank of England. Because they reminded the public of hearses, these buses were shunned for some time. Finally Shillibeer employed as conductors two sons of British Naval officers, who had had bus experience in France, With the spread of this news, poke-bonnetted young ladies demurely decided to improve their French and proceeded to take regular bus rides for educational purposes, with perhaps a discreet flirtation on the side. Free newspapers and magazines were distributed to the riders, and the buses be-came so popular Shillibeer decided to ex-tend the service. This necessitated the employment of paid conductors, but since no method was then known for checking up the number of passengers, Shillibeer finally retired bankrupt. Later he became an undertaker.

In the meantime two other rival buses were in operation, and in 1855, the Compagnie Generale des Omnibus de Londres, a French company, began operation with 27 buses. Again Londoners refused to ride the buses and protested the "forcign innovation" so strenuously that the police were forced to intervene. When the company agreed to buy all the old bus routes and employ the same English drivers and conductors the opposition ceased.

The present London omnibus system accommodates more than 6,000,000 passengers daily.

Subway Building Hurried in Buenos Aires

With 40,000 new people in 1928 added to its more than 2,000,000 population, Buenos Aires, Argentina, finds it necessary to hurry the extension of its underground transit facilities.

To that end, construction is now in full swing in excavating and building the east and west subway line, while contracts on north and south side line extensions have been awarded to one of the city's well-known corporations.

Present activity is centered on the section of work comprised between Federico Lacroze Station and Callao Street. As the excavation from this street is to a

point near the river front or port section of Buenos Aires, the authorities are taking three months' time for consideration of the plans, which are expected to be approved within a few weeks.

The company holding the concession for the link from Retiro Station to Plaza Constitucion, which will cross the city in a north and south direction, has completed its drawings, which are in the hands of municipal authorities for approval.

The original unit of the underground transit system in Buenos Aires was constructed by the same corporation that holds the franchise for operating the electric surface cars.

The original line is that now in operation between Plaza de Mayo and Plaza Once de Septiembre. This route passes largely under the great business thoroughfare, Calle Mayo, whose overflowing streets are to some extent relieved as thousands descend to the subway.

Conspicuous sights that catch the stranger's eye in Buenos Aires subways are the color schemes adopted for stations; one of these may be yellow, another green, another blue, etc. Such colors, together with striking signs, greatly aid the stranger's trip.

Air Transport Powers Granted British Railways

Powers to add air transport to their existing facilities were granted the British main line railway companies in bills recently sanctioned by a joint committee of both Houses of Parliament. In every case where a railway applies for a license to establish an airdrome, the Air Council, a government department, must hold a local inquiry. Services to and from Ireland, the Hebrides, the Isle of Man, and the Channel Islands are contemplated, as well as services to and from the Continent of Europe.

Subway to Be Built in Osaka—Plans are under way to begin subway construction in Osaka, Japan, probably within the next few weeks. The first section of the subway will connect Mina-katamachi and Abiko, but the construction work will be started in four sections simultaneously, the most important being the work at the Osaka station of the Government Railway. The boring at this point will be to a depth of 55 ft. The tube will run underneath the Dojima-gawa, Oye-bashi and Yodoyabashi Rivers at a depth of about 25 ft. below the river-beds.

Recent Bus Developments

Long-Distance Lines Merge

Bus lines operating in all sections of the United States are to be included in a proposed consolidation intended to unify long distance motor transportation operation so that a dependable service may be maintained in the nation-wide system of bus travel which has recently been developed. The three principal companies involved are the Greyhound Lines, the Yelloway System, and the Pickwick Stages. Merging with these companies are the bus lines of the Southern Pacific Motor Transport Company, owned by the Southern Pacific Railway. These systems stretch from the Atlantic to the Pacific Coast. They constitute the only system of passenger transportation of the kind which extends entirely across the United States.

Operations on the Pacific Coast will be

Operations on the Pacific Coast will be under Pacific Transportation Securities, Inc., and cover Oregon and California, routes of the Yelloway, Pickwick Stages, Southern Pacific Motor Transport Company, Oregon Stages, and Pacific Stages. In addition there are the lines run by the Pickwick Stages from Los Angeles through Arizona and New Mexico to El Paso, and the line from San Francisco to Salt Lake City by way of Reno. Ownership will be vested equally among the Motor Transit Corporation, the Pickwick Corporation and the Southern Pacific Company.

Pickwick and Yelloway operation between Los Angeles and Chicago, Kansas City, Omaha, and St. Louis will be under the Pickwick-Greyhound Corporation with ownership divided between the Pickwick Corporation and the Motor Transit Corporation.

Greyhound Lines east of the Mississippi River will remain undisturbed by the merger; they are owned entirely by the Motor Transit Corporation.

The merged operations represent a capital investment of about \$30,000,000. More than 1,000 buses will be operated 200,000 miles a day over 25,000 miles of routes. The number of passengers carried annually will exceed 10,000,000.

The chairman of the board of the Pacific Coast Corporation will be C. E. Wickman of Minneapolis. The president will be T. B. Wilson, formerly head of the Southern Pacific Motor Transport operations and the chairman of the executive committee will be C. F. Wren, president of the Pickwick Corporation.

No change is being made in the personnel of the Motor Transit Corporation except that W. E. Travis has been made chairman of the board. He has been president and manager of the Yelloway systems.

All of the companies concerned have played an important part in long distance bus transportation, and represent the chief elements of this form of passenger service.

People's Necessity Outweighs Traction Loss in Ohio

The Scioto Valley Railway & Power Company has lost its long-time fight to prevent the Cannonball Transportation Company from extending its bus line from Chillicothe, Ohio, to Columbus. By way of Portsmouth the bus company operates

a line from Ironton to Chillicothe. In a majority opinion, the State Public Utilities Commission held that the necessity of the people of southern Ohio to have a direct method of transportation into Columbus outweighed the fact that the electric railway company would lose money if the Cannonball's request were granted.

The opinion restricts the Cannonball to service over state route 104 from Chillicothe to Columbus, and Cannonball buses must not carry Chillicothe and Circleville passengers, but only through-passengers both ways out of Columbus. The opinion left open the way for the railway, which sought to operate supplemental bus service itself, to amend its own application and protest so that it may be able to operate buses over state route 23 from Chillicothe to Columbus.

Judge William Klinger, Lima, dissented from the majority opinion, holding that the Supreme Court had said the commission could not give a certificate to another utility when the utility at present operating in that territory was willing to give extra service if needed.

Substitution in Savannah—Authority has been granted the Savannah Electric & Power Company, Savannah, Ga., by the Council to substitute bus service for the present railway service on the Daffin Park line.

Over the Berkshire Trail—The Northampton Street Railway plans to project a bus service from Northampton to Pittsfield, Mass., over the Berkshire Trail. Permits have been obtained from Northampton, Williamsburg, Goshen and Cummington, but action is still pending in Dalton and Pittsfield.

Would Stop Buses in Santa Ana— The Pacific Electric Railway has asked the Railroad Commission for permission to discontinue its bus lines in Santa Ana.

Substitution in Davenport—Tracks of the Gaines Street or Mercy hospital line will be ahandoned and buses installed to give the same service over the route, if present plans of the Tri-City Railway, Davenport, Ia., meet the approval of the City Council. General Manager R. J. Smith of the company says that lack of sufficient income from the Gaines Street line prompted the company to adopt the plan to replace street cars with buses.

Substitution in Fitchburg Opposed—Opposition developed to the proposal of the Fitchburg & Leominster Street Railway to substitute bus service for trolleys over the Merriam Avenue route between Fitchburg and Leominster, Mass., when the hearing was held before the license board of the latter city. The Lovell Bus Lines, Inc., which operates in Leominster, including the West Street line, which runs parallel with Merriam Avenue, asked to be protected from the competition it said would result if the railway received the permission it sought. E. W. Baker, president of the railway, explained that the outlay to improve the roadway would not be justified by the revenue.

Pacific Electric Adds to Bus Service—A certificate of public convenience and necessity has been granted by the California Railroad Commission to the Pacific Electric Railway, Los Angeles, to operate an auto stage service between Hollywood and Girard, Cal.

Petition for Indiana Curtailment—The Chicago, South Bend & Northern Indiana Railway has asked authority to discontinue all local bus service on the south side of the city of Elkhart, Ind. The company also wants to be permitted to discontinue service on lines operating to the north section of the city after 9 p.m. and to eliminate all bus service in the city on Sundays and holidays. Expenses of bus operation in Elkhart exceeded revenue by more than \$6,264 in 1928. The principal business district and residential sections of the city are served by the company

Mayors Favor Chehalis - Centralia Change—After a hearing in Chehalis, Wash., on May 13, of an application of W. E. Brown, to establish inter-city bus service between Chehalis and Centralia to replace the interurban service of the Puget Sound Power & Light Company, the Mayors of both cities favored the change and, with others, urged that the franchise be granted.

Buses Unprofitable — The Illinois Power & Light Corporation has applied to the Illinois Commerce Commission for permission to discontinue bus service in Hillsboro, Schram City and Taylor Springs on the grounds that the route is unprofitable. The buses were substituted for street cars several years ago. City officials have been advised of the plans for the abandonment of bus service.

Buses for Ashmont Under Special Bill—Governor Allen of Massachusetts has signed the bill to settle the dispute over a proposed bus line in the Ashmont section of Greater Boston. The Boston City Council has refused to grant the necessary permit for construction of part of this line. The bill signed by the Governor authorizes the Department of Public Works to issue the license not-withstanding the disapproval of the City Council. The route to be followed is from the corner of Hilltop Street and Granite Avenue to the Ashmont station of the Elevated and thence into Milton. The bill provides further that after a public hearing the Utilities Department will grant the certificate of public convenience and necessity.

Another Bus Substitution at Framingham—The Middlesex & Boston Street Railway is planning the early substitution of bus service on its line between Framingham, Mass., and the Newton, Mass., boundary. The substitution of bus service leaves only one electric railway operating out of Framingham, Mass., the Boston, Worcester & New York Street Railway.

Patrons Expect Something for Nothing—Suspension of the Arlington, Belmont & Watertown bus line by the Boston Elevated Railway, Boston, Mass., has been followed by a statement by the company that the discontinuance was necessary because it was clearly apparent there was an insufficient demand for the service. The trustees give the cost per revenue-mile as 32 cents against receipts of 12 cents. Those who oppose the suspension contend it is immaterial whether the line is profitable since it is a feeder for other lines.

Financial and Corporate

Des Moines Sale June 22

Property of the Des Moines City Railway, Des Moines, Ia., operated under a receivership since Nov. 11, 1927, will be sold at public auction on June 22. The receivership was instituted when the Harris Trust & Saving Bank, Chicago, brought action in the federal court after the railway had defaulted in payment of \$700,000 of bonds for which the bank acted as trustee. Under the decree the sale is subject to a first mortgage of \$5,762,000.

The decree of sale authorizes the master if dissatisfied with bids, to set a new date upon his own authority and to postpone the actual sale "from time to time." He is empowered to convey the property to the highest bidder, subject to approval of the

Local interest centered upon the inclusion in the decree of an order authorizing the master to sell the system either with or without the two-man car operation agreement entered into in 1915 between the company and the union—a contract which runs until 1940. A Polk County District Court held that the contract is binding. Officials of the company say they could save \$200,000 annually by the operation of one-man cars.

Michigan Interurban Curtails Service

J. F. Collins, vice-president and general manager of the Michigan Electric Railway, announced that all electric interurban passenger service on the Jack-son and Lansing division of the company would cease after midnight May 18 and that electric passenger service between Lansing and St. Johns and inter-mediate points would be discontinued on and after midnight May 16. This move leaves the northern division entirely operated by motor vehicles-electric service on that division having been terminated some time ago. Disposition of the right-of-way will be determined later. Interurban freight service on lines connecting Jackson, Kalamazoo and Grand Rapids will be continued. Interurban passenger traffic on this branch was discontinued some months ago.

\$734,242 Premium on New York Stock

The city of New York obtained a premium of \$734,242 on the sale of \$52,000,000 four-year, rapid transit 5½ per cent corporate stock to Kuhn, Loeb & Company and to Henry G. Schneider, an individual bidder. The effect of the premium above the face value of the bonds is to reduce the net interest cost of the financing to the city from 5.25 per cent to approximately 4.81 per cent.

The first issue of \$52,000,000 corporate stock for rapid transit construction was sold in February, 1928, to the National City Company syndicate at a premium of \$254,-784 on 4 per cent coupon basis, or a 3.86 per cent net cost basis. The offering made on May 7 was scheduled originally for last November, when \$55,000,000 in bonds was sold, but because of the unfavorable condi-

tion of the municipal market the sale of the stock was postponed. The stock sale last year was made during the most favorable period of the municipal bond market.

Offer Made for Muskegon Railway

Negotiations have been started for the purchase of the railway lines of the Muskegon Traction & Lighting Company, Muske-

gon, Mich., by the officials of the Peoples Transport Company, which plans to operate the street car lines in conjunction with its bus lines. If all goes well with these plans the city will retain transportation facilities that were to have been abandoned early in the fall.

With negotiations started for the purchase of the lines, the Muskegon Parent-Teachers' Association announces it will withdraw the petition just filed asking for a vote on the question of municipal owner-

The Peoples Transport Company wants to issue \$500,000 of capital stock divided into 50,000 shares with a par value of \$10. The president is E. J. Bouwsma; vice-president and treasurer, M. J. Britzen; secretary. Willard G. Turner, Jr.

Supreme Court Decides O'Fallon Case

Holds that Congress has directed that values shall be fixed upon a consideration of present coststhat element one of many factors

THE long awaited decision in the action of the St. Louis & O'Fallon Railway and the Manufacturers' Railway against the Interstate Commerce way against the Interstate Commerce Commission was handed down by the Supreme Court on May 20. The majority held that in this instance the commission had not given due consideration, as required by law, to the principle of reproduction cost new in fixing the valuation of the carriers for rate-making and recapture purposes under the provisions of the transporta-tion act of 1920.

The majority opinion said: "We hold, that the hasis on all calculations as to the reasonableness of rates to be charged must be the fair value of the property being used by it for the

convenience of the public.

"In order to ascertain that value, the original cost of construction, the amount expended in permanent improvements, the amount and market value of the bonds and stock, the present as compared with the original cost of construction, the probable earning capacity of the property under particular rates prescribed by statute, and the sum required to meet operating expenses, are all matters for consideration, and are to be given such weight as may be just and right in each case.

"We do not say that there may not be other matters to be regarded in estimating the value of the property. What the company is entitled to ask is a fair return upon the value of that which it employs for the public convenience. On the other hand, what the public is entitled to demand is that no more be exacted from it for the use of a public highway than the services rendered by it are reasonably worth."

Basis of "Intelligent Forecast"

"In Southwestern Bell Telephone vs. Public Service Commission (287) we

"'It is impossible to ascertain what will amount to a fair return upon properties devoted to public service without giving consideration to the cost of labor, supplies, etc., at the time the investiga-tion is made. An honest and intelligent forecast of probable future values, made upon a view of all the relevant circum-stances, is essential. If the highly im-

portant element of present costs is wholly disregarded such forecast becomes impossible. Estimates for tomorrow cannot ignore prices today.'
"The doctrine above stated has been

consistently adhered to by this court. The report of the commission is long and argumentative. Much of it is devoted to general observations relative to the method and purpose of making valuations; many objections are urged to the doctrine approved by us; and the superiority of another view is stoutly asserted.

"It carefully refrains from stating that any consideration whatever was given to present or reproduction costs in estimating the value of the carrier's property. Four dissenting commissioners declare that reproduction costs were not considered; and the report itself confirms their view. Two of the majority avow a like understanding of the course pursued."

QUOTES COMMISSIONER HALL

"The following from the dissenting opinion of Commissioner Hall, concurred in by three others, accurately describes the action of the commission:

"In order to determine the value of the O'Fallon property devoted to carrier service during the recapture periods, ten months in the year 1920 and the years 1921, 1922 and 1923, we start with a valuation or inventory date of June 30, 1919. The units in existence on that date are known. Original cost of the entire property cannot be ascertained.

"As to the man-made units we esti-

mate the cost of reproducing them in their condition on that date. In so doing their condition on that date. In so doing we apply to the units installed prior to June 30, 1914, the unit prices of 1914, the unit prices of 1914, representing a fairly consistent price level for the preceding five or ten years. To like units, installed after June 30, 1924, and prior to June 30, 1919, we apply the same prices, but add a sum representing increases on those units during the same prices. price increases on those units during that period. For the third period, from June 30, 1919, down to each recapture date, we abandon estimate and turn to recorded net cost of additions less retirements.
"'On this composite, made up of esti-

mated value for two periods and ascer-

tained net cost for the third period, the majority base a conclusion as to value at recapture date of the man-made items. Land goes in at its current value as measured by that of neighboring lands.

"'Without summarizing the other processes, all clearly stated in the majority report, it will be observed that the rate-making value arrived at for the successive recapture periods, as for example the year 1923, rests upon 1923 market value of lands; costs of other property installed since June 30, 1919; unit prices of 1914, enhanced by allowance for increased cost of units installed during June 30, 1914-1919; and for the units installed prior to June 30, 1914, constituting by far the major part of the property; unit prices of 1914 without any enhancement whatever.

"'As to this major part of the carrier's property devoted to carrier purposes in 1923, no consideration is given to costs and prices then obtaining or to increase

therein since 1914.'

'The question on which the commis-

sion divided is this:

When seeking to ascertain the value of railroad property for recapture pur-poses must it give consideration to current, or reproduction, costs? The weight to be accorded thereto is not the matter before us. No doubt there are some, perhaps many, railroads the ultimate value of which should be placed far below the sum necessary for reproduction. But Congress has directed that values shall be fixed upon a consideration of present costs, along with all other pertinent facts; and this mandate must be obeyed."

In his dissent Associate Justice Stone began by stating that he desired to add a word by way of emphasis of those aspects of the case "which appeared to me sufficient, apart from all considerations, to sustain the finding of the He added: commission."

"This court has said that present reproduction costs must be considered in ascertaining value for rate-making purposes. But it has not said that such evidence, when fairly considered, may not be outweighed by other considerations affecting value, or that any evidence of present reproduction costs, when compared with all the other factors affecting value, must be given a weight to which it is not entitled in the judgment of the tribunal 'informed by experience' and 'appointed by law' to deal with the problem now presented.

"But if 'weight in the legal sense' must be given to evidence of present construction costs by the judgment now given, we do not lay down any legal rule which will inform the commission how much weight, short of its full effect, to the exclusion of all other considerations, is to be given to the evidence of synthetic costs of construction in valuing a railroad property.

SEES AN "ECONOMIC PARADOX"

"If full effect were to be given to it in all cases, then, as the commission points out in its report, the railroads of the country having in 1919 a reproduction cost of value of \$19,000,000,000 would now have a value of \$40,000,000,-000, and we would arrive at the economic paradox that the present value of railroads is far in excess of any amount

on which they could earn a return.

"If less than full effect may be given, it is difficult for me to see how, without departure from established principles, the commission could be asked to do more than it has already done-to weigh the evidence guided by all the proper considerations—or how, if there is evidence upon which its findings may rest, we can substitute our judgment for that

of the commission.
"Such, I believe, is the 'due consideration' which the statute requires of 'all the elements of value recognized by the law for rate-making purposes."

JUSTICE BRANDEIS' OPINION

In the dissenting opinion prepared by Associate Justice Brandeis, the minority takes issue with the majority decision that in valuing railroad property in the O'Fallon case the Interstate Commerce Commission failed to give weight to the cost of "reproduction new."

The Justice contended that, while current reproduction cost may be said to be an element in the present value of property, it was clear "that current cost of reproduction higher than the original cost does not necessarily tend to prove a present higher value."

In this connection he added: "Often the fact of higher reconstruc-tion cost is without any influence on present values. It is common knowpresent values. It is common know-ledge that the current market value of many office buildings and residences constructed prior to the World War have failed to reflect the greatly in-creased building costs of recent years, although the need of new buildings of like character was being demonstrated by the large volume of construction at

the higher price level.

"Many railroads built before the
World War have never been worth as much as their original cost, because high construction cost, combined with adverse operating conditions and limited traffic, have at all times prevented their earning, despite reasonable rates, a fair

return on the original cost.
"* * * If it had been the intention of Congress to compel the commission to increase values for rate making purposes because the price level had risen, it would naturally have incorporated such a direction in the paragraph.

"It is inconceivable that Congress, after rejecting property investment account as excessive, intended by Section 15A to make mandatory on the commission the consideration of elements which would give a valuation double that which had been rejected."

Conspectus of Indexes for May, 1929

Complied for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY Electric Railway Engineer, Worcester, Mass.

		Month		Last 5	Years
	Latest	Ago	Ago	High	Low
Street Rallway Fares* 1913 = 4.84	May	April	May	May	Jan.
	1929	1929	\$2	1929	1924
	7, 76	7.75	2.54	7.76	6.91
Electric Railway Materials* 1913 = 100	May	April	May	March	Feb.
	1929	1929	1928	1924	1928
	145.5	145.0	140.4	163.9	139.5
Electric Railway	May	April	May	April	Jan.
Wages*	1929	1929	1928	1929	1924
1913 = 100	230.1	230.1	229.2	230.1	217.4
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	May	April	May	March	Sept.
	1929	1929	1928	1924	1927
	199, 5	200. 9	201.9	206.8	199, 4
Eng. News-Record Construction Cost (General) 1913 = 100	May	April	May	March	Nov.
	1929	1929	1928	1924	1927
	205.2	203.4	207.0	221.7	202.0
U.S. Bur. Lab. Stat. Wholesale Commodities 1926 = 100	April	March	April	Nov.	April
	1929	1929	1928	1925	1927
	96.8	97.5	97.4	104.5	93.7
Bradsfreet Wholesale Commodities 1913 = 9,21	May	April	May	Dec.	July
	1929	1929	1928	1925	1924
	12.68	12.87	13.44	14,41	12.23
U. S. Bur. Lab. Staf. Retail Food 1913 = 100	April	March	April	Nov.	May
	1929	1929	1928	1925	1924
	151,6	153.0	152, 1	167.1	141.0
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	April	March	April	Nov.	March
	1929	1929	1928	1925	1929
	159, 3	159, 8	160, 8	171.8	159.8
Industrial Activity Elec. World—Kwhr used 1923-25 = 100	April	March	April	Feb.	July
	1929	1929	1928	1929	1924
	136, 4	135.7	119.3	140.4	73.4
Bank Clearings Outside N. Y. City 1926 = 100	April	March	April	Feb.	May
	1929	1929	1928	1929	1924
	104. 0	103.9	105, 6	110.1	84.4
Business Failures Number Liabilities (Millions)	April	March	April	Jan.	Sept.
	1929	1929	1928	1924	1928
	1738	1703	1672	2231	1348
	32.59	35.44	41.13	122,95	23.13

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these

Changes in United Traction Directors -Arthur R. Kleeman, Edward J. Crummey, and Bruce Gamley, directors of the United Traction Company, Albany, N. Y., placed on the board by the Ellis I. Phillips' interests, have been displaced by representatives of the Associated Gas & Electric Company interests, including John Mange, president of Associated. James Hamilton, Ernest Murphy, General manager of United Traction, and Harry B. Weatherwax, vice-president, continue as directors.

Virginia Road Sold—Purchase of the Petersburg, Hopewell & City Point Electric Railway, Petersburg, Va., has been made by Roy H. Morris and associates of Chicago, at a reported cost of \$330,000, the transfer to be made by June 15, the date of the expiration of an option held by the Chicago interests.

Receivership Ended - The Receivership of Manhattan & Queens Traction Corporation, New York, has been ter-minated, according to B. Waller Duncan, manager for the receivers, by order of the federal court. The company operates between Manhattan and Jamaica via the Queensborough Bridge and Queens Boulevard.

roads.

Men of the Industry

Frank R. Phillips, Philadelphia Company Executive

Becomes chief executive officer of organization controlling the Pittsburgh Railways and other utilities in Pittsburgh

STOCKHOLDERS of the Philadelphia Company, Pittsburgh, Pa., at a meeting on May 14, elected John J. O'Brien president of the company and Frank R. Phillips, a director. It was announced that at the next meeting of the directors Mr. Phillips would be elected vice-president and general manager. Since the resignation of A. W. Robertson, formerly president of the Philadelphia Company, to become chair-man of the board of the Westinghouse Electric & Manufacturing Company some months ago, the presidency of the Philadelphia Company has been vacant. Mr. Phillips, who has been vice-president and general manager of the Duquesne Light Company and vice-president of the Equitable Gas Company, in his new position becomes chief executive officer of the Philadelphia Company and subsidiaries. capacity it is understood that he will exercise all of the operating duties heretofore devolving upon the president. The principal devolving upon the president. The principal subsidiaries of the Philadelphia Company are the Duquesne Light Company, Pittsburgh Railways, Equitable Gas Company, Pittsburgh Motor Coach Company and Allegheny Steam Heating Company.

John J. O'Brien, the new president of the Philadelphia Company regides in Chi-

the Philadelphia Company resides in Chicago and is president of the Standard Gas & Electric Company, the utility system of which the Pittsburgh companies are a part.

Mr. Phillips is a nationally known figure in the public utility field. He has been connected with the utilities in Pittsburgh for the past nineteen years. After connected in 1804 pleting his education in Cleveland in 1894, Mr. Phillips became master mechanic of the Cleveland Railway. Following this he served as mechanical and electrical engineer for the Union Light, Heat & Power Com-Water Company of Bellevue, Ky., the Bellevue Water Company of Bellevue, Ky., and the South Covington & Cincinnati Street Railway also of Covington, Ky. He went to Pittsburgh in the fall of 1909 to assist in the development of the railways in that city. His first achievement was the low-floor, steel car operated with pony trucks and so-called baby motors which went into service in 1910, but was followed a year later by a low-floor steel trolley car, both of which proved less costly in construction and more economical in operation than the types which had preceded them.

In 1910 he was made superintendent of equipment of the Pittsburgh Railways, a position he filled until July, 1923, when he was made acting general manager for the P. M. Jones. Upon the lifting of the re-ceivership on February 1, 1924, Mr. Phillips was made mechanical and electrical engineer and was also appointed the repre-sentative of the company to the Traction Conference Board.

Mr. Phillips was active in designing the double-deck motor car placed in service in Pittsburgh in 1917. About the same time he designed a low-floor, high-speed, all steel interurban car of a type which has since been made standard on the Pittsburgh Railways lines. Mr. Phillips was also active in

the construction of the new cars which have recently been placed in service on the Pittsburgh Railways lines, including the one-man cars and those used in multipleunit operation.

He has become nationally known through his activities in behalf of the American Electric Railway Association, in which he has served on many important committees. He is a past-president of the Pennsylvania Street Railway Association, and is now president of the Pennsylvania Electric Association.



Frank R. Phillips

On Sept. 1, 1926, Mr. Phillips was elected vice-president and general manager of the Duquesne Light Company and subsidiaries, and in April, 1928, was elected vice-president of the Equitable Gas Company and its subsidiaries.

G. J. Marott Heads New Indianapolis District

George J. Marott, Indianapolis, has just been named by Mayor Slack of that city as a member of the board of trustees of the city's new utility district. His term of office is for three years. For many years Mr. Marott was president of the former Indiana Railways & Light Company. A public utilities district was created for Indianapolis by the last Legislature. Under the law, the utilities district will have control of all city-owned utilities, none of which are so owned at present. The idea back of the formation was the acquirement of the local gas company. In the future, if it is deemed necessary to create or acquire any further utilities, the district under the law will have charge.

Major T. J. Strickler, president of the Kansas City Gas Company, Kansas City, Mo., on May 18 was elected president of the Missouri Association of Public Utilities at the closing session of the three-day meeting of that body at Sedalia, Mo. Mayor Strickler succeeds A. E. Reynolds, Springfield.

L. S. Storrs Honored

His Work Is Lauded and Resolutions Passed Formally Acknowledging His Signal Service

UCIUS S. STORRS, who resigned on April 1 as managing director of the American Electric Railway Association to accept the post as executive chairman of the board of the United Railways & Electhe board of the United Railways & Elec-tric Company of Baltimore, was tendered a dinner at the Mayflower Hotel, Washing-ton, on the evening of May 1 during the meeting of the United States Chamber of Commerce. Members of the Advisory Council, the American Electric Railway Association executive committee, and many other prominent executives of the industry joined in this tribute to the service which Mr. Storrs has rendered the industry dur-

Mr. Storrs has rendered the industry during his four years as managing director.
J. N. Shannahan, chairman of the Advisory Council, was toastmaster. The speakers included B. C. Cobb, J. P. Barnes, Thomas N. McCarter, James H. McGraw, Paul Shoup, A. W. Robertson, Homer Ferguson, W. H. Sawyer, R. P. Stevens and Mr. Storrs Mr. Storrs.

Mr. McCarter commented on the period readjustment for the industry during which Mr. Storrs helped to bring about more collective thinking and a broadened perspective in the industry. He expressed the conviction that an industry which renders a service so vital to modern communities can be put upon a sound financial basis and declared emphatically that the problems of the local transportation industry must be solved in the interest of those who have invested in them in good faith and of the country itself.

President Barnes extolled the guest for his persistent confidence in the industry. and lauded the qualities of patience and tact through which Mr. Storrs had brought about closer co-operation among properties in working for the solution of collective

problems.

Mr. McGraw attributed the present difficulties of the industry to its failure to anticipate the condition which all but overwhelmed it. "The time has come," declared Mr. McGraw, "to look forward, not backward. During the last four years Mr. Storrs as managing director has helped us to understand the factors which caused our difficulty and has aided us in looking toward the future instead of the past.'

MR. STORRS DEEPLY MOVED

Mr. Storrs protested his total inability to express adequately his feelings of gratification. He declared, however, that one of life's principal accomplishments is the accumulation of warm friends, and that this testimonial from those with whom he had worked so closely during his service as managing director would constitute a cherished memory during the remainder of his days.

The executive committee of the association tendered Mr. Storrs a unanimous vote of appreciation for the outstanding service which he has rendered during an exceedingly difficult period of readjustment. resolution to this effect said in part:

"His confidence in the basic soundness of the business of local transportation has never wavered. He has aided in bringing about a better public understanding of the problems of the industry and of the essential and indispensable part which public transportation plays in the life of the modern community.

"He has been both a counsellor and

friend to the executives of the entire industry. Through his genial personality and unusual qualities of tact and judgment, he has brought about increased co-operation between operating companies and now leaves the American Electric Railway Association better organized and functioning at the highest state of efficiency and effectiveness in its history. Due to his enthusiasm, keen interest and wide grasp of local transportation fundamentals, he has stimulated the work of committees of both the American Association and its several affiliated organizations. Through his contact with other industries and associations, and with the several agencies of government, he has brought about a better public understanding of the problems of local transportation, accompanied by increased good will.

good will.

"Mr. Storrs leaves the position of managing director to assume again the direction of the destinies of an individual operating property, for which position of responsibility he is pre-eminently qualified. The executive committee of the American Electric Railway Association accepts his resignation with deep regret. It extends to him the good wishes of the entire industry for his continued success in his new position and congratulates the directors of the United Railways & Electric Company and the public of Baltimore upon having enlisted the services of so eminent and well qualified a local transportation executive and so delightful and genial a citizen and gentleman."

George Stokes in Charge of Equipment on Insull Line

George Stokes has been appointed general inspector of cars and equipment of the Chicago, South Shore & South Bend Railway, the Chicago, North Shore & Milwaukee Railroad, the Chicago, Aurora & Elgin Railroad and the Chicago Rapid Transit Company. Mr. Stokes has been with the North Shore Line for the past seven years. Starting with the transportation department in May, 1922, as collector, he was made conductor the following year, in the Chicago-Millwaukee service. Before joining the North Shore Line, Mr. Stokes was connected with the Pullman Company.

Former Senator Heads Commission's Legal Staff

William Cabell Bruce, former United States Senator from Maryland, has been appointed general counsel to the Maryland Public Service Commission by Gov. Albert C. Ritchie, who at the same time announced that John H. Lewin, a prominent Baltimore lawyer, would become people's counsel to the commission.

Mr. Bruce was general counsel to the commission from the time the commission was organized in 1910 until 1922, when he resigned to become a candidate for the United States Senate. Later the post of general counsel was abolished, but it was revived in 1927 by an act of the General Assembly. No appointment was made, however; Raymond S. Williams, a Baltimore lawyer, serving as special counsel in some cases. It has been announced that Mr. Williams will continue to serve in the cases in which he has been interested and which are still pending. The most important of these is the car fare case of the United Railways & Electric Company, which is to be argued before the United States Supreme Court in the fall.

Mr. Lewin, who formerly was assistant city solicitor of Baltimore, will succeed Thomas J. Tingley, resigned.

D. L. Turner Resigns

Consulting engineer to New York Commission will go into private practice Sept. 1
after thirty years of city service

ANIEL L. TURNER, consulting engineer to the New York Transit Commission and the Board of Transportation, and for nearly thirty years intimately associated with the planning and developing of the city's rapid transit lines, will retire from public service on Sept. 1. Mr. Turner will make a trip around the world and will then resume private engineering practice.

It has truthfully been said that in his

It has truthfully been said that in his entire career Mr. Turner's first allegiance has been to the city of New York. Not content with merely performing his duties as an engineer, Mr. Turner enlarged the fields of his work by studying the trends of traffic and investigating the results of



D. L. Turner

local transportation extensions upon the outlying districts of the city and upon the community as a whole. By this work he made himself an expert on urban transit and acquired a reputation which attracted the attention of the nation.

The extent to which this is true is instanced by his work on the joint vehicular and rapid transit highway in Detroit, his service as consulting engineer on rapid transit in that city, his work since 1924 as consulting engineer for the Pittsburgh Transit Commission and for the North Jersey Commission, and his retention as consultant in other similar projects.

Mr. Turner served in New York with the Rapid Transit Board, the Public Service Commission, the Rapid Transit Construction Commission, the Rapid Transit Commission and the Board of Transportation. His first post was that of assistant to William Barclay Parsons, chief engineer in charge of construction of the first subway. In 1918 he became chief engineer of the Public Service Commission, and in 1921 was named consulting engineer to the Transit Commission. When the Board of Transportation was organized in 1924 he was designated as its engineering consultant.

As a matter of fact his first connection with rapid transit in this city was in December, 1900, when subways were unknown. He left the Lawrence Scientific School at Harvard University, where he was an instructor in surveying and hydraulics, to become an aide of the Board of Rapid Transit Railroad Commissioners. He drew the plans for draining the new subway lines here and later conducted surveys for Brooklyn extensions.

He served for many years on the New York State Commission of Fine Arts, and

since 1927 has headed the Suburban Transit Engineering Board, acting under the direction of the Port of New York Authority.

He was born Oct. 25, 1869, in Portsmouth, Va., and his retirement will come a few weeks before his sixtieth birthday. He received his engineering training at the Rensselaer Polytechnic Institute. While an instructor at Harvard, he drew plans for improving and draining Soldiers Field, the university athletic ground.

Mr. Turner is a member of many engineering societies and organizations concerned with city planning and civic welfare.

Changes in District Commission

It is expected that the Senate soon will confirm President Hoover's nomination of Maj. Gen. Mason M. Patrick and Harleigh H. Hartman to be members of the Public Service Commission of the District of Columbia, but the reorganization of the commission cannot be completed before June 1, as the resignation of John W. Childress, the present chairman, does not become effective until May 31. General Patrick, successor to Mr. Childress, therefore, cannot take office before that date. Mr. Hartman, who was appointed to succeed Col. Harrison Brand, Jr., however, is expected to be inducted into office soon after Senate confirmation.

Messrs. Parry and Thomas in New Salt Lake Posts

P. M. Parry, since 1920 commercial manager for the Utah Power & Light Company, Salt Lake City, has been elected vice-president and commercial manager of that company, and George B. Thomas, formerly secretary and treasurer, has been elected vice-president and secretary.

Both of these men have had long experience in the public utility field. Mr. Parry was connected with the Utah Power & Light Company's predecessor in Ogden for many years. He was made manager of its Ogden division in 1912, at the time of the consolidation of several companies into the present organization, and held that position until he was made commercial manager of the company in 1920.

Mr. Thomas was auditor of the Telluride Power Company prior to the organization of the Utah Power & Light Company, and was named auditor and assistant treasurer of the latter company in 1912, later becoming secretary and treasurer. He is also secretary and treasurer of the Utah Light & Traction Company and holds similar offices with the Western Colorado Power Company, Durango.

O. C. Gettinger Promoted by Elgin Road

O. C. Gettinger, trainmaster for the Chicago, Aurora & Elgin Railroad for the past nine years, has just been appointed superintendent of transportation in direct charge of all train movements of the railroad, both passenger and freight.

In October, 1908, he entered railroad ser-

In October, 1908, he entered railroad service as a conductor on the Aurora City lines. By the end of the following year he qualified as a motorman and shortly thereafter began working for the Chicago, Aurora & Elgin Railroad. In 1912 he was made train dispatcher at Wheaton, from which post he was promoted to train master in 1920.

W. J. McCarter and P. W. Ogden in New Cleveland Posts

Walter J. McCarter has been appointed superintendent of training of the Cleveland Railway, Cleveland, Ohio, reporting to Clinton D. Smith, superintendent of the department of personnel.

Mr. McCarter is a graduate of the Class of 1921, Purdue University, where he was awarded the degree of bachelor of science in electrical engineering and was elected to several honorary fraternities. He joined the Milwaukee Electric Railway & Light Company in the fall of 1921, and as a student engineer and during the course of his practical training, he served as motorman, conductor, lineman, shop man, tester and substation operator, supplementing his special training with the study of industrial relations.

In 1922 and 1923 he served as instructor of engineering subjects in the industrial relation or industrial department, and in the fall of 1923 was made principal assist-ant to Dr. A. J. Rowland, educational

director.

In January, 1926, Mr. McCarter was appointed supervisor of training in the transportation department of the Milwauthe Company, and as such supervised the training of all new employees, and the follow-up training of the employees after their permanent assignment. His success in this work culminated in his appointment as assistant educational director on Jan. 1, 1929. In this latter capacity he has served all departments of the company.

Mr. McCarter knows the efficiency of the motorman selection tests used in recent years at Milwaukee as an effective means for selecting suitable employees for the transportation service. He has also been instrumental in the development of one of the most complete employee training programs that may be found among public

utility companies.

As superintendent of training of the Cleveland Railway Mr. McCarter will head a new division which will include the employment or selection of employees, the training and educational program for new and older employees, and accident prevention activities, all according to the general program of the personnel department as outlined in the ELECTRIC RAILWAY JOURNAL for July 2, 1927, at the time of the announcement of the appointment of Clinton D. Smith as superintendent of personnel.

The new division of training has been formed in conformity to the convictions of President J. H. Alexander that transporta-tion can be merchandised, and that increased sales will be obtained from specific instruction or training of the employees. The program of the division includes the mechanical or psychological test for new employees, and the correlation of such tests with individual studies of accident-prone This specialization of training conmen. centrates on the individual development and accepts general education as supplemental to the major task. It will be applicable to all transportation service employees.

Effective also as of May 1 Mr. Philip W. Ogden was appointed supervisor of employment, reporting to Mr. McCarter.

Mr. Ogden matriculated at East High School, Rochester, N. Y., in 1911, and then attended Mechanics Institute, Rochester, attended Mechanics Histitute, Roenester, where he pursued the co-operative engineering course. In 1916 he was graduated from Cornell University. Prior to the World War, in which he served as Second Lieutenant in the Quartermaster's Corps, Mr. Ogden was associated with T. H. Symington Company, Rochester, N. Y.,

and after the Armistice was connected with

the Eastman Kodak Company, Rochester. He joined the Cleveland Railway in 1922, and for a period of three years carried on research activities under the direction of Mr. Alexander, then vice-president of the company. Since 1925, and until his appointment, Mr. Ogden has been associated with M. W. Rew, superintendent of the motor coach department, in which post he was responsible for personnel activities, including employment.

W. J. Stanton Heads Metropolitan Section A.E.R.A.

To fill the unexpired term of A. LeRoy Hodges, recently resigned, W. J. Stanton was recently chosen president of the Metropolitan Section, A.E.R.A. Mr. Stanton has taken an active interest in the affairs



W. J. Stanton

of the section ever since its organization, and has figured prominently in the activities of the supply men's group in New

York City for many years.
"Jerry," as he is known to his host of friends, was born in Schenectady, March 7, 1884. He secured his early education in that city and upon completing high school work joined the General Electric Company. After a few years in the testing department, he entered the railway engineering department and in 1910 was transferred to the railway sales department under J. G. Barry with headquarters in New York City. This work took him to all parts of the United States.

He resigned from the General Electric Company in 1918 to accept a position as sales manager for the Railway Improve-ment Company in New York City. The following year found him associated as sales manager with the National Railway Appliance Company, and shortly afterward he went with the Ohio Brass Company, with which he remained for eight years, working out of the New York office. On June 1, 1928, he resigned to accept a position as vice-president and treasurer of the Cuban-American Manganese Corporation, which position he holds at the present time.

D. E. Watson Acting Vice-President in Indianapolis

At a meeting of the directors of the At a meeting of the directors of the Indianapolis Street Railway, Indianapolis, Ind., on May 16, 1929, the following officers were elected: D. E. Watson, active vice-president, L. T. Hixson, secretary and treasurer, J. P. Tretton, general manager, T. L. Fox, second assistant secretary and treasurer.

Marshall S. Morgan resigned from the board. This left two vacancies which were filled by the election of D. E. Watson and J. P. Frenzel, Jr.

E. L. Bodge at Ottawa

E. L. Bodge, formerly assistant freight traffic manager of the Illinois Terminal Railroad, has been appointed traffic manager of the Chicago & Illinois Valley Railroad, at Ottawa, Ill., succeeding R. G.

Near, resigned.

Mr. Bodge was traffic manager of the t. Louis, Troy & Eastern Railroad at St. Louis, Troy & Eastern Railroad at St. Louis, Mo., for several years, and after this line was consolidated with the Illinois Traction System was made coal traffic manager of the latter road. Upon the merging of the Illinois Traction System with the Illinois Terminal Railroad, he was appointed assistant freight traffic manager, in which capacity he served until he was made traffic manager last month of the Chicago & Illinois Valley, a subsidiary.

G. A. Burnham Heads American Brown Boveri

George A. Burnham, president of Condit Electrical Manufacturing Corporation, has accepted the presidency of American Brown Boveri Company, Inc., of Camden, N. J., a newly formed subsidiary of the American Brown Boveri Electric Corporation, created for the purpose of placing all electrical and mechanical operations, exclusive of ship building, under one management,

Mr. Burnham has been granted patents on many inventions pertaining to the con-trol and protection of electric circuits. He is actively interested in the American In-stitute of Electrical Engineers and the National Electrical Manufacturers' Association. During the last nine months, in addition to his duties as president of Condit Electrical Manufacturing Corporation, he has been assistant to the president of American Brown Boveri Electric Corporation, and general manager of the electricalmechanical division, activities now included

in American Brown Boveri Company, Inc. He was born in Essex, Mass., 1882, and was graduated from Tufts College, B.S. in Engineering 1908, M.S. 1910. Prior to attending college he was engaged in the construction and operation of power plants. Soon after graduation he was employed by the Condit Electrical Manufacturing Company finally being elected president of the Condit Electrical Manufacturing Corporation, successor to the Condit Electrical Manufacturing Company, in 1926.

Traffic Officials of Indiana Service Promoted

The transportation department of the Indiana Service Corporation, Ft. Wayne, Ind., has announced the promotion of the following employees:

Newton Archer promoted to accounting department from passenger and freight agent, Lafayette, Indiana.

George Garvin promoted to agent at Lafayette from assistant agent at Wabash. Clyde Root transferred from agent at Peru passenger station to passenger and freight agent at Marion.

Merle McKee promoted from assistant agent at Peru passenger station to agent.

Paul Wire promoted from clerk at Huntington to assistant agent at Peru passenger station.

Henry W. Blake

Veteran editor of Electric Railway Journal dies. Had served industry thirty-eight years. Author and authority on American and foreign practice

HENRY W. BLAKE, senior editor of the ELECTRIC RAILWAY JOURNAL, died at his home in Englewood, N. J., on May 20. Until a few months ago, Mr. Blake had been in his accustomed good health, but at that time, at the suggestion of his physician, he postponed a contemplated trip to Europe, during which he had ex-pected to gather additional material for the notable series of articles on European electric railway and bus practice which have been appearing since a similar trip made by him about two years ago. Despite this decision to forego the trip to Europe, the condition of his health did not appear to warrant special concern on the part of his physician, family or associates.

Late last week, however, he suffered a severe attack of nervous exhaustion which did not respond to the treatments usually efficacious in offsetting attacks of this kind.

AN UNUSUAL CULTURAL BACKGROUND

Henry W. Blake was in many respects a great technical editor. He brought to his task as a young man an unusual equipment. He was learned not only in engineering, which he had studied at Yale University and the Massachusetts Institute of Technology, but in the liberal arts and in the humanities. Added to this background was the cultural influence of a period spent in Europe at the conclusion of his academic studies. If destiny did not decree that he be an editor, certainly there have been few men in the history of technical journalism better fitted than was he for the work to which he was to dedicate his life. Aside from his cultural and technical attainments he brought to his career as an editor a carefully poised judicial mind, wholehearted devotion to his task and a sense of the verities that seemed at times almost uncanny.

During the thirty-eight years Mr. Blake served the ELECTRIC RAILWAY JOURNAL and its predecessors many revolutionary changes were effected in the methods of mass transportation. In 1891 when he came to the JOURNAL, the argument between cable and electric advocates was at its height. In addition there loomed as possibilities the compressed air car, the storage battery car, and other forms of motive power. He served actively as editor during the period of the rapid expansion of the electric railway in city, suburban and interurban service and finally during the period in which the bus appeared—first, as a competitor and, then, as an adjunct to the already established transportation agencies. In the interval between these major movements came the development of electricity for use in heavy traction with its so-called battle of the systems, during which Mr. Blake kept his readers apprised of the progress being made, while at the same time he main-tained the editorial balance without which no paper truly serves its readers. content with that, and while still carrying full editorial responsibility, he prepared for publication in book form, in collabora-tion with Walter Jackson, "Electric Rail-way Transportation."

As was indicated at the time he was honored by his associates on the occasion of the completion by him in 1921 of thirty years of service as editor, Mr. Blake made and held hundreds of friends in the industry, partly through the charm of his per-

sonality and partly through his willingness always to share his amazing knowledge of mass transportation methods and practices which embraced the entire period from the horse-bus and horse-car to their modern automotive and electric successors. Certainly, as one of his associates once said of him he "wrote his very life into the columns of the Electric Railway Jour-" In so doing he wielded an influence that cannot possibly be measured, but has



Henry W. Blake

been felt and is today reflected on almost

every electric railway in the country.
So far as the chronological history of Mr. Blake's connection with the paper goes, it dates from his appointment to the staff in 1891 and covers the subsequent periods of his selection as editor in 1894, his sharing of the editorial responsibilities with Edward E. Higgins for several years before the turn of the century and his carrying the full editorial responsibility from 1899 to 1922, when he again shared the editorial responsibilities with another-Harold V. Bozell. He was appointed senior editor in 1925 in which post, after many years, he was relieved of direct re-sponsibility for the paper and at that time relinquished active administration of editorial work in accordance with his own plan of devoting more and more time to his personal activities and of engaging in only such editorial duties as best fitted into his plan of allowing himself more leisure.

HAD KEEN SENSE OF OBLIGATION

Mr. Blake was graduated from Yale in the civil engineering course in 1886 and then took the course in electrical engineering at the Massachusetts Institute of Technology, after which he became connected with the Sprague Electric Railway Motor Company, at that time engaged in the construction of electric railways in various cities in the United States. Like his father before him and like the New Englander that he was, Mr. Blake had a keen sense of his obligations, including his obligation to his alma mater. That he was held in high esteem by his fellow class-mates is attested to by the fact that for many years he had been Alumni Fund Agent for his class, an office of special honor and distinction.

Mr. Blake was born in New Haven on Dec. 7, 1865. He is survived by his wife, one daughter and one son.

He was a member of the American Institute of Electrical Engineers, a member of the International Railway & Tramway Association, and during the formative years of the American Electric Railway Association he contributed abundantly of his time and influence to the work of the association, particularly that of the affiliated bodies, participating in the development of the standard classification of accounts.

APPRECIATION BY JAMES H. McGRAW

James H. McGraw, publisher of the ELECTRIC RAILWAY JOURNAL, with whom Mr. Blake had been continuously associated during his thirty-eight years of serv-

ice with the paper, said of him:

"Henry W. Blake was a great editor.

His name will go down in the history of industrial journalism with the names of those other great editors of the past: Col. Henry G. Prout of Railway Gazette, W. D. Weaver of Electrical World, Arthur M. Wellington of Engineering News, Charles Kirchhoff of Iron Age, John M. Goodell of Engineering Record and Frank Wight of Engineering News-Record. For thirty-eight years he was intimately associated with the upbuilding of the ELECTRIC RAILWAY JOURNAL and of the McGraw-Hill Publishing Company. Very early in his career he grasped the ideal of editorial service and leadership upon which this in-

stitution was founded.

"In the early days Street Railway Journal was devoted to the interests of the horse, its care and its car. But electric propulsion was being promoted by men who saw the limitations of the horse and cable, and the possibilities of electricity. Convinced with me of the fundamental principle of technical and business jour-nalism, that industry is always ready for real leadership, Henry Blake took hold of the helm of his paper firmly. In recognizing that the editor's responsibility is not merely to present current news and opinion, but to provide a vehicle for advancing thought, he stamped the imprint of his mind and personality indelibly upon the paper and the industry to which his life was devoted."

Joseph A. McGowan

Joseph A. McGowan, 69 years old, vet-cran railway executive of Indianapolis, died on May 13. He had been acting president of the Indianapolis Street Railway and the Terre Haute, Indianapolis & Eastern Traction Company since the death of Robert I. Todd last July. Mr. McGowan had been ill for several days prior to his death. Strain due to increase in work upon assuming the presidency of both companies is believed to have aggravated the heart condition from which he suffered and which really caused his death.

Mr. McGowan went to Indianapolis in 1903 at the instance of his cousin, the late Hugh J. McGowan, who was then developing the Indianapolis Street Railway and the old Indianapolis Traction & Terminal Company, of which he was president.

Joseph A. McGowan became auditor and

later secretary and treasurer, serving in the latter position until his death, in addition to his duties as acting president of hoth companies.

Mr. McGowan was born in Ireland.

Industry Market and Trade News

169 Exhibitors Take 96,196 Sq. Ft. of Space

Assignments made for Atlantic City convention, Sept. 28 to Oct. 4, as result of two days of deliberation by committee.

Another impressive display assured

REDERICK C. J. DELL, director of exhibits of the American Electric Railway Association, reported at the second meeting of the exhibit committee held at Atlantic City, N. J., on May 16 the following comparative results of space applications for the meeting Sept. 28 to Oct. 4:

Number of Approxima	t t C
Space Number of	ρf
Year Requests Square Fe	et
1923	
1924 141 60,865	
1925 172 98,293	
1926 183 95.001	
1927 216 104,143	
1928 177 98.840	
1929 169 96,196	

When the convention opened last year there had actually been sold 109,420 sq.ft. to 251 exhibitors. Of this 109,420 sq.ft. 38,212 sq.ft., or approximately 29 per cent, was occupied by buses, trucks and body manufacturers, this space having been assigned to 23 companies.

This year so far sixteen bus, truck and body manufacturers have applied to the electric railway association for 32,734 sq.it., or 32 per cent, of the total space available, which amounts to 102,498 sq.ft.

As a result of two days of deliberation on the part of the committee these assignments were made:

Exhibitors at the 48th Annual A.E.R.A. Convention, Together With Spaces to Be Occupied by Each Company

Company	Space Number	Company Fruehaul Trailer Co	Space Number
Adams & Westlake Co	E-619	Fruehauf Trailer Co	C-355 and
Ahlborg Bossing Co	C'.341_342		F-608-609
Aluminum Co. of America American Brake Materials Corp American Brake Shoe & Foundry Co.	E-628	Fuller & Sons Mig. Co	C-300
American Brake Materials Corp	E-602-603	General Electric Co	C 200
American Brass Co	E-600-601	Globe Ticket Co W. S. Godwin Co., Inc Gold Car Heating & Lighting Co Goroco Mechanical Spreader Co	E-549
American Car & Foundry Motors Co	C-308	W. S. Godwin Co. Inc.	D-404
American Fork & Hoe Co	D-402	Gold Car Heating & Lighting Co	E-548
American Steel & Wire Co	D-428-430	Goroco Mechanical Spreader Co	E-520
American Fork & Hoe Co	E-599	Grimii wheel Co	アン・ノロサ・ノロン・ノロロ
Anderson Body Co	Portion of	Hale & Kilburn	E-500-501
Anderson Brake Adjuster Co	C-302	Hannum Manufacturing Co Haskelite Manufacturing Co	E-516
Aqua Oil Service, Inc	E-523	Herenles Motors Corn	C-304
Arco Co	C-334-335-336	Hercules Motors Corp Heywood Wakefield Co	E-506-507
Baldwin Locomotive Works	Portion of	Hilliard Corp	E-623
	E-617	Hilliard Corp Hunt-Spiller Manufacturing Corp	C-348
Bender Body Co	C-306	Hyatt Roller Bearing Co	E-522
Bendix Brake Co	C-303	Illinois Motive Equipment Co	Portion of E-587
Bethlehem Steel Co	E-610-611-612-	Intersoll-Rand Co	3-105-107-109
Detinement Steel Co.,	613-614-615-	Ingersoll-Rand Co	Portion of
	616	international index co	C-307
Bosch Magneto Co., Robert Bragg-Kliesrath Corp	E-532	International Register Co	E-595
Bragg-Kliesrath Corp	Portion of	Internation Steel Tie Co	1)-401-403-405-
Bridgeport Brass Co Brill Co., J. G.	C-305		
Bridgeport Brass Co	E-3/9	Irving Iron Works Co	E-33/-339
Buda Co	E-618	Johns-Manville Corp	Portion of
Budd Wheel Co	C-324	Johnson Pare Box Co	E-587
	Portion of	Johnston Paint Co., R. F	E-621
Bus Transportation Philip Carey Co. Carnegie Steel Co.	E-575	Kelton-Aurand Mig. Co	C-345
Philip Carey Co	D-413-415	Kenfield Davis Pub. Co	E-588
Carnegie Steel Co	D-429-431	Lang Body Co	Portion of
Chase & Co., L. C	E-606 D 422	Loon Navilla Co	C-302
Chillingworth Mfg. Co	E-581	Leece-Neville Co	D-432-433-434-
Chilton Class Journal Co	E-589	Lorain Deed Co	435
Christonson Air Broke Co	C 322	Macdonald Mfg. Co	E-622
Clark Equipment Co	C-332	Mack-International Motor Truck	Portion of
Cleveland Pneumatic Tool Co	C-301	W 1 W	C-307
Clark Equipment Co. Cleveland Pneumatic Tool Co. Cleveland Tanning Co. Collier, Inc., Barron G. Continental Motors Corp.	U-302-333-334	Mack-Motor Truck Co	C-307
Continental Motors Corp	C-351	Mack Trucks, Inc	
Consolidated Car Heating Co	E-512	Mack Trucks, Inc	C-307
Crew Levick Co	E-533	Manganese Steel Forge Co	E-604
Cummings Car & Coach Co	E-525	Metal & Thermit Corp. Moisselle W Ided Rail Joint Co. Money-Meters, Inc. Morton Mig. Co.	1)-418-419-420
Curtain Howe Corp	E-555	Moisselle W lded Rail Joint Co	D-410
Dayton Mechanical Tie Co	D-412-414	Money-Meters, Inc	E-60/
Dayton Steel Foundry Co	E-321 E-510	Morton Mig. Co	tion of E-529
DeLuxe Products Corp DeVilbias Co	E-561A	Motor Wheel Corp Nachod & U. S. Signal Co	C-346
DeVilbias Co DeWalt Products Corp.	A-100	Nachod & U. S. Signal Co	D-424
Differential Steel Car Co	Portion of	National Bearing Metals Corp	E-591
5 1 5 4 5	E-550	National Brake Co	Portion of
Dodge Brothers Corp	C-315-316	Notional Cook on Co	E-528-529
Earl C I	D-400 E-583	National Carbon Co	C-330-331
Eherhard Mfg. Co	E-505	National Cash Register Co. National Malleable & Steel Castings.	E-540
Earll, C. I. Eberhard Mfg. Co Economy Electric Devices Co Edwards Company, Inc., M. Electric Railway Improvement Co	C-319B	National Pneumatic Co	E-508-509-510-
Edwards Company, Inc., M.	E-524		511
Electric Railway Improvement Co	E-551-553	National Railway Appliance Co	Portion of
ELECTRIC RAILWAY JOURNAL	Fortion of	NDtNttC	C-319
Electric Service Supplies Co	E-575	New Departure Manufacturing Co Nichols-Lintern Co	C-343
Elleon Co	E-576 and Por-	Norma-Hoffmann Bearings Corn	E-592
	tion of E-528	North East Electric Co	C-326
Erie Malleable Iron Co	C-329	North East Electric Co. Oakite Products, Inc. Obio Brass Co.	E-552-554
rerodo and Aspestos, Inc	C-337-338	Ohio Brass Co	E-502-503-504-
Frazer Electric Transmission Co	C-320B	Oleman Pama Danistin Ci	505 E 547
Fremont Metal Body Co	. C-349-330	Ohmer Fare Register Co	E-30/

OkoniteCallender Cable Co	E-597
	D-408
Pantasote Co., Inc.	E-515
Power Mfg. Co.	E-620
Public Service Coordinated Transport	E-594
Pyrene Mfg. Co	E-561B
Radel Leather Mfg. Co	C-347
Rail Joint Co	D-400
Railwaa Age	E-590
Railway Materials Corp	E-545
Railway Trackwork Co	D-421-423-425
Ranway Trackwork Co	
Railway Utility Co	E-550B
H. H. Robertson Co	E-542
Rochester Printing Co	E-584
Ross Gear & Tool Co	C-325
Safety Car Devices Co	Portion of 570
St. Louis Car Co	E-627
Sattley Co	E-584
Carrier Co. Co.	E-300
Saums Co., Geo	E-303
S K F Industries, Inc	E-598
Skinner Automotive Device Co	E-586 E-585 E-598 C-344
Spicer Mfg. Corp Standard Johnson Co	C=303A
Standard Johnson Co	C-320A
Standard Steel Works Co	Portion of
realidard beer works Co	E-617
Channe Chafferd D.H. D	
Stearns-Stafford Roller Bearing	E-558
Studebaker Corp. of America	C-312-313-314
Templeton Kenly & Co., Ltd	D-426
Texas Co Timken-Detroit Axle Co	E-625-626
Timken-Detroit Axle Co	C-317
Timken Roller Bearing Co	T) / Of
	E-6U5
Tool Steel Gear & Pinion Co.	E-605 C-319C
Tool Steel Gear & Pinion Co	C-319C
Tool Steel Gear & Pinion Co Transit Equipment Co	C-319C E-560
Tool Steel Gear & Pinion Co Transit Equipment Co Tuco Producta Corp	C-319C E-560 E-541-543
Tool Steel Gear & Pinion Co Transit Equipment Co Tuco Products Corp Twin Coach Corp.	C-319C E-560 E-541-543 C-310
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tuco Producta Corp. Twin Coach Corp. Una Welding & Bonding Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205
Tool Steel Gear & Pinion Co. Tranşit Equipment Co. Tueo Products Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624
Tool Steel Gear & Pinion Co. Tranşit Equipment Co. Tueo Products Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624
Tool Steel Gear & Pinion Co Transit Equipment Co Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557
Tool Steel Gear & Pinion Co. Transit Equipment Co. Trueo Products Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Míg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tuco Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Walter Motor Truck Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-557 E-518 C-321
Tool Steel Gear & Pinion Co. Transit Equipment Co. Transit Equipment Co. Twin Coach Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Watter Motor Truck Co. Waukesha Motor Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-557 E-518 C-321
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Watter Motor Truck Co. Watter Motor Co. Westinghouse Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tuco Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Walter Motor Truck Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-557 E-518 C-321
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Watter Motor Truck Co. Watter Motor Co. Westinghouse Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569
Tool Steel Gear & Pinion Co. Transit Equipment Co. Transit Equipment Co. Transit Equipment Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Wader Motor Truck Co. Waukesha Motor Co. Weatinghouse Co. Westinghouse Elec. & Mfg. Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-318 E-569 E-571-572-573-574
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Watter Motor Truck Co. Watter Motor Co. Westinghouse Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-557 E-518 C-321 C-318 E-569 E-571-572-573-574 Portion of
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Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Products Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Walter Motor Truck Co. Waukesha Motor Co. Westinghouse Co. Westinghouse Elec. & Mig. Co. Westinghouse Traction Brake Co. Wm. Wharton, Jr., & Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573-574-Portion of E-570 D-416-417
Tool Steel Gear & Pinion Co. Transit Equipment Co. Transit Equipment Co. Tuco Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Wadell Engineering Co. Walter Motor Truck Co. Waukesha Motor Co. Westinghouse Co. Westinghouse Elec. & Mfg. Co. Westinghouse Traction Brake Co. Wm. Wharton, Jr., & Co. Wheel Truing Brake Shoe Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547
Tool Steel Gear & Pinion Co Transit Equipment Co Tueo Producta Corp Twin Coach Corp Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co Van Dorn Coupler Co Wadell Engineering Co. Watter Motor Truck Co. Waukesha Motor Co Westinghouse Co Westinghouse Elec. & Mig. Co Westinghouse Traction Brake Co Wm. Wharton, Jr., & Co Wheel Truing Brake Shoe Co White Co	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547
Tool Steel Gear & Pinion Co Transit Equipment Co Tueo Producta Corp Twin Coach Corp Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co Van Dorn Coupler Co Wadell Engineering Co. Watter Motor Truck Co. Waukesha Motor Co Westinghouse Co Westinghouse Elec. & Mig. Co Westinghouse Traction Brake Co Wm. Wharton, Jr., & Co Wheel Truing Brake Shoe Co White Co	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-554 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556
Tool Steel Gear & Pinion Co Transit Equipment Co Tueo Producta Corp Twin Coach Corp Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co Van Dorn Coupler Co Wadell Engineering Co. Watter Motor Truck Co. Waukesha Motor Co Westinghouse Co Westinghouse Elec. & Mig. Co Westinghouse Traction Brake Co Wm. Wharton, Jr., & Co Wheel Truing Brake Shoe Co White Co	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-554 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556
Tool Steel Gear & Pinion Co. Transit Equipment Co. Transit Equipment Co. Transit Equipment Co. Twin Coach Corp. Uni Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Wadell Engineering Co. Walter Motor Truck Co. Waukesha Motor Co. Westinghouse Co. Westinghouse Elec. & Mfg. Co. Westinghouse Traction Brake Co. Wm. Wharton, Jr., & Co. White Co. White Mfg. Co. Wilson Imperial Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556 E
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Products Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Water Motor Truck Co. Waukesha Motor Co. Westinghouse Co. Westinghouse Elec. & Mig. Co. Westinghouse Elec. & Mig. Co. Wm. Wharton, Jr., & Co. White Co. White Co. White Mig. Co. Wilson Imperial Co. Winchester Repeating Arms Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556 C-339-340 E-559 C-339-340 E-534-535
Tool Steel Gear & Pinion Co. Transit Equipment Co. Transit Equipment Co. Tuco Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mfg. Co. Universal Lubricating Co. Wan Dorn Coupler Co. Wadel Engineering Co. Wadel Engineering Co. Water Motor Truck Co. Waukesha Motor Co. Westinghouse Co. Westinghouse Elec. & Mfg. Co. Westinghouse Traction Brake Co. Wm. Wharton, Jr., & Co. White Co. White Mfg. Co. Wilson Imperial Co. Wilson Imperial Co. Winchester Repeating Arms Co. Wood Steel Co., Alan	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556 C-339-340 E-559 C-339-340 E-534-535
Tool Steel Gear & Pinion Co. Transit Equipment Co. Tueo Producta Corp. Twin Coach Corp. Una Welding & Bonding Co. Union Metal & Mig. Co. Universal Lubricating Co. Van Dorn Coupler Co. Wadell Engineering Co. Watter Motor Truck Co. Watter Motor Truck Co. Westinghouse Co. Westinghouse Elec. & Mig. Co. Westinghouse Elec. & Mig. Co. Wistinghouse Traction Brake Co. Wine Truing Brake Shoe Co. White Co. White Mig. Co. Wilson Imperial Co. Winchester Repeating Arms Co. Wood Steel Co., Alan. Wood Conversion Co.	C-319C E-560 E-541-543 C-310 D-427 & B-205 E-624 E-544 E-557 E-518 C-321 C-318 E-569 E-571-572-573- 574 Portion of E-570 D-416-417 E-547 C-311 E-556 C-339-340 E-559 C-339-340 E-534-535
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Okonite Co..... E-596

Track space on Convention Hall Plaza, immediately in front of the Atlantic City Auditorium, has been assigned to the following companies for the display of street cars: The J. G. Brill Co., Cincinnati Car Co., Consolidated Car Heating Co., Osgood Bradley Car Co., Safety Car Heating Co., St. Louis Car Co., Twin Coach Co.

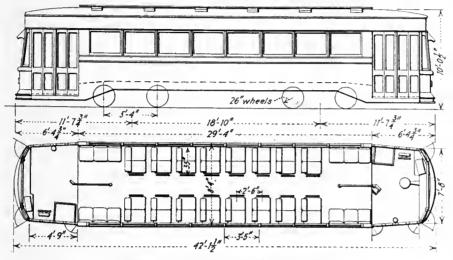
Third Avenue Railway May Use Trackless Trolleys

Following an investigation of the operation of trackless trolleys in Salt Lake City, as well as experiments made locally, officials of the Third Avenue Railway System, operating in New York City and Westchester County, are understood to favor their adoption for service between White Plains and Tarrytown as soon as the necessary permission can be obtained from the local authorities. An application to operate the new vehicles has been filed with the City Council of White Plains as well as with the authorities in Tarrytown, Greenburgh and Elmsford, where local officials have tentatively given their consent. Official approval is expected within thirty days. If the trackless trolleys are adopted a new carhouse for service and storage will have to be erected in White Plains, as the old carhouse was abandoned when trolley service was suspended several years ago. The present garage is of insufficient size to accommodate any considerable number of new conveyances.

Specifications of Recent Car Orders

Details regarding a number of recent car orders placed with the J. G. Brill Company, as previously told in this paper, are now available. The ten one-man cars ordered for city service by the Delaware Electric Power Company, of Wilmington, Del., are to seat 44 passengers and will weigh complete with equipment, 35,740 lb. They are of the low platform stepless type in general use on that property and embody in

Journa Ibearings
Journal boxesBrill M.C.B.
Lamp fixtures
Motors
Five cars Westinghouse 510, inside hung
Painting scheme Orange, cream and red
Roof material
Sash fixtures
SeatsBrill reversible 201-D type
Seat spacing
Seating material
Slack adjustersBrill mechanical
Step treads



Elevation and floor plan of Wilmington cars

their equipment and fixtures an extensive use of aluminum. Five of the cars will be provided with General Electric No. 265 motors, inside hung, four to the car, and five will have Westinghouse No. 510 motors. Air brake equipment is also to be divided between Westinghouse and the General Electric Company. The accompanying plans and specifications show further details regarding the new cars. Delivery is expected to be made during the early part of July.

SPECIFICATIONS FOR DELAWARE ELECTRIC POWER COMPANY CARS

Name of railway. Delaware Electric Power Company City and state
Number of units
Number of units. 10 Type of unit. One-man, motor, passenger, city, double-end, double-truck
Number of seats44
Builder of car bodyJ. G. Brill Company
City and statePhiladelphia, Pa.
Date of order
Date of deliveryJuly 1, 1929
Weights:
Car body
Trucks
Equipment
Total
Length over all
Length over body posts
Truck wheelbase
Width over all 8 ft. 4 in.
Height, rail to trolley base
Window post spacing
BodySemi-atecl
RoofArch
Doors
Air brakes
Five cars Westinghnuse Armature bearings. Plain Axles. Brill A.S.T.M. spec., A-20-21
Armature bearings
AxlesBrill A.S.T.M. apec., A-20-21
Car signal system Faraday high voltage Compressors Five cars-G. E. Co-27;
Compressors Five cars-G. E. Co-27;
Five ears Westinghouse DH-27 ConduitFlexible Duratube
Control K-35
Control
DoorsFolding
Fare boxes
Finish Enamel
Floor covering
Glass Non-shatterable
Hand brakes Peacock staffless Hand straps White, porcelain enamel Heaters Consolidated Car Heating Co.
if and straps
Heaters Consolidated Car Heating Co.
Headlights Electric Service Supply Co., Keystone
Headlining
Interior trim

Trolley catchers Earl	l
Trolley base Ohio Brass Company	,
Trolley wheels Feist, Ohio Brass Company	,
TrucksBrill 177-E-1	
VentilatorsBrill exhaust type	
Wheels, typeRolled steel 26 in. diameter	r
Wheelguards or fenders Parmenter	r

The five double-truck cars for interurban service on the lines of the Philadelphia & Western Railway will have a seating capacity of 51 passengers and will weigh complete, about 63,000 lb. They will be equipped for two-man operation, and will have both center and end doors. Additional data are supplied in the accompanying table.

SPECIFICATIONS FOR PHILADELPHIA & WESTERN RAILWAY CARS

Name of railwayPhiladelphia & Western Railway
City and state
Number of units5
Type of unitTwo-man, motor, passenger,
interurhan, double-end, double-truck
Number of seats
Number of seats
City and state
Date of order
Weights:
Car body
Trucka
Equipment
Total
Bolster centers
Length over all
Length over body posts
Truck wheelbase
Width over all 9 ft. 7 in.
Height, rail to trolley base
Window post spacing
BodyAll steel
RoofArch
Doors
Air brakes Westinghouse—AMM
Armature bearings Plain
Armature bearings
Car signal system Faraday huzzer
Car signal system
Conduit
Conduit
Couplers Tomlinson Form 16
Couplers
Curtain material
Door mechanism
Doors Sliding
Energy saving device Economy meter
FinishLacquer
Floor covering
Gears and pinionsNuttall, forged steel
and brakes

Heaters	Railway Utility Company
	Mahogany
Journal bearings	
Journal boxes	. E. S. S. Co's Ivanhoe domes
Lamp fixtures	E. S. S. Co's Ivanhoe domes
	tinghouse 535-B-1 inside hung
	Ohmer
Roof type	Arch
Roof material	Poplar, canvas covered
Seats	Brill reversible 202-B type
Seat spacing	
Seating material	
Slack adjusters	Truck—Brill mechanical Car—American Brake Co'a
Steps	Folding and stationary
Troller bece	
Trolley whoole	
Trucks	Brill M.C.B2X
Ventilatore	Railway Utility Company
Wheels Standar	d Steel Works, 30 in. diameter
,, inces,	di Decel Works, 50 in, diameter

The two cars recently ordered by the Newell Bridge & Railway Company of Newell, W. Va., are being built by the Kuhlman Car Company, Cleveland, Ohio. They are intended for city use, and will seat 42 passengers each. The accompanying table contains additional information as to dimensions and equipment.

SPECIFICATIONS FOR NEWELL BRIDGE & RAILWAY COMPANY CARS Name of railway. Newell Bridge & Railway Company

Number of units
City and state Newell, W. Va. Number of units 2 Type of unit. Two-man, motor, passenger, city, double-end, double-truck Number of seats 46 Builder of car body Kuhlman Car Company City and state 1978 Date of order 1979
Number of seats46
Builder of car bodyKulilman Car Company
City and stateCleveland, Ohio
Date of order
Weights:
Car body
Trucks
Equipment
Total32,000 lb.
10 10 10 10 10 10 10 10
Length over att. 45 ft, 3 in. Length over body posts 33 ft, 3 in. Truck wheelbase 4ft, 10 in.
Length over body posts
Truck wheelbase4 ft. 10 in.
Width over all 8 ft. 6 in. Height, rail to trolley base 10 ft. 5 in. Window post spacing 42 in.
Height, rail to troiley base
Window post spacing42 in.
BodySemi-steel
RoofArch
DoorsEnd
Air brakesWestinghouse straight air
Doors End Doors End Air brakes Westinghouse straight air Armature bearings Plain Axles Brill standard
AxlesBrill standard
Car signal system
CompressorsD.H. 16
ConduitFlexible
Control
Conduit. Flexible Control. K 35 KK Door mechanism. National Pneumatic Company
Doors Folding
Fare boxesCleveland
Finish. Enamel Floor covering. Wood mat, strips Gears and pinions. Western Elec. & Mfg. Company Glass. D. S. A. selected
Floor covering
Gears and pinions Western Elec. & Mig. Company
Glass
Hand brakes
131
Hand brakes Peacock staffless Hand straps Electric Service Supply Company
Hand strapsElectric Service Supply Company sanitary grip
Heat insulating material
Heat insulating material. Celotex Heaters Consolidated Cnr Heating Company Headlights Crouse-Hinds portable Hendlining Agosote Interior trim Mahogany Journal bearings Plain Journal boxes Brill 34x6 in. Lamp fixtures Westinghouse Motors Westinghouse S08-A, inside hung Roof material. Wood and canvas Sash fixtures. Adams & Westlake
Heat insulating material. Celotex Heaters Consolidated Car Heating Company Headlights Crouse-Hinds portable Hendlining Agosote Interior trim Mahogany Journal bearings. Plain Journal boxes Brill 34x6 in. Lamp fixtures Westinghouse Motors Westinghouse 508-A, inside hung Roof material Wood and canvas Sash fixtures. Adams & Westlake Seats Brill Seat suscing Lamptitudinal
Heat insulating material. Celotex Heaters Consolidated Car Heating Company Headlights Crouse-Hinds portable Hendlining Agosote Interior trim Mahogany Journal bearings. Plain Journal boxes Brill 34x6 in. Lamp fixtures Westinghouse Motors Westinghouse 508-A, inside hung Roof material Wood and canvas Sash fixtures. Adams & Westlake Seats Brill Seat suscing Lamptitudinal
Heat insulating material. Celotex Heaters Consolidated Car Heating Company Headlights Crouse-Hinds portable Hendlining Agosote Interior trim Mahogany Journal bearings. Plain Journal boxes Brill 34x6 in. Lamp fixtures Westinghouse Motors Westinghouse 508-A, inside hung Roof material Wood and canvas Sash fixtures. Adams & Westlake Seats Brill Seat suscing Lamptitudinal
Heat insulating material. Celotex Heaters. Consolidated Cnr Heating Company Headlights. Crouse-Hinds portable Hendlining. Agosote Interior trim. Journal bearings. Journal boxes. Brill 3½x6 in. Lamp fixtures. Westinghouse 508-A, inside hung Roof material. Wood and canvas Sash fixtures. Adams & Westlake Seats. Brill Seat spacing. Seat spacing. Seating material.
Heat insulating material. Celotex Heaters. Consolidated Cnr Heating Company Headlights. Crouse-Hinds portable Hendlining. Agosote Interior trim. Journal bearings. Journal boxes. Brill 3½x6 in. Lamp fixtures. Westinghouse 508-A, inside hung Roof material. Wood and canvas Sash fixtures. Adams & Westlake Seats. Brill Seat spacing. Seat spacing. Seating material.
Heat insulating material. Celotex Heaters. Consolidated Cnr Heating Company Headlights. Crouse-Hinds portable Hendlining. Agosote Interior trim. Journal bearings. Journal boxes. Brill 3½x6 in. Lamp fixtures. Westinghouse 508-A, inside hung Roof material. Wood and canvas Sash fixtures. Adams & Westlake Seats. Brill Seat spacing. Seat spacing. Seating material.
Heat insulating material. Celotex Heaters. Consolidated Cnr Heating Company Headlights. Crouse-Hinds portable Hendlining. Agosote Interior trim. Journal bearings. Journal boxes. Brill 3½x6 in. Lamp fixtures. Westinghouse 508-A, inside hung Roof material. Wood and canvas Sash fixtures. Adams & Westlake Seats. Brill Seat spacing. Seat spacing. Seating material.
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Heat insulating material. Celotex Heaters Consolidated Car Heating Company Headlights Crouse-Hinds portable Hendlining Agosote Interior trim Mahogany Journal bearings. Plain Journal boxes Brill 34x6 in. Lamp fixtures Westinghouse Motors Westinghouse 508-A, inside hung Roof material Wood and canvas Sash fixtures. Adams & Westlake Seats Brill Seat suscing Lamptitudinal

J. G. Brill Company, Philadelphia, Pa., has brought out an attractive catalog on Brill master unit cars. Features maintained for the cars are light weight, quick acceleration, riding comfort, low-level platforms and floors, passenger appeal, maximum safety and circulating passenger load. These unit cars will be either single end or double end, double truck or single truck.

Electric Terminal Development Gets Underway in St. Louis

Preliminary work of clearing away builddings on the site of the proposed electric passenger and freight terminal in the downtown section of St. Louis, Mo., which is proceeding under the direction of engineers of the St. Louis Electric Terminal Railway, sets in motion a development that will ultimately involve the investment of millions of dollars in that vicinity in warehousing, shipping and transportation facilities.

The elevated and subway tracks included in this improvement, together with the terminal warehouse which is to be constructed on High Street north of Lucas Avenue, will, it is estimated, cost approximately \$5,000,000. Other commercial developments and improvements sponsored by private interests are expected to call for the expenditure of an equal amount, and a considerable section of St. Louis, which has made little progress in recent years, will undergo extensive development.

Plans call for the establishment of a subway area under and east of High Street

and between Washington and O'Fallon Streets in which will be located a terminal yard. The proposed passenger station will be built at the Washington Street end of this area, and from this point through trains will be operated over the lines of the Illinois Traction System to Venice, Granite City and other points in central Illinois. North of the passenger station development and over the subway area it is proposed to erect a terminal warehouse approximately twelve stories in height in which industries and wholesale organiza-tions will be housed, thus affording direct freight trackage facilities over the Illinois Traction System and its steam railroad connections. The subway will also permit of a similar service to other warehouses and buildings which can be constructed over the air rights thus created.

The entire plan owes its conception to the necessity, long recognized, of providing additional freight facilities for the several carriers operated by the Illinois Terminal Railroad System.

Brown Boveri Organizes New Subsidiary

For the purpose of placing all electrical and mechanical operations exclusive of shipbuilding under one management the American Brown Boveri Electric Corporation has organized a subsidiary corporation to be known as American Brown Boveri. Company, Inc. At the company's plant at Camden, N. J., are produced steam turbines, blowers, compressors, transformers, mercury arc rectifiers, electric locomotives and railway equipment, under designs, processes and patents of Brown Boveri & Company, Ltd., of Switzerland.

American Brown Boveri Company, Inc., owns the entire capital stock of the Condit Manufacturing Electrical Corporation, which company will continue the manufacture and sale of its electrical control and protective equipment, through its own organization. Officers of the company are George A. Burnham, president: Maurice L. Sindeband, vice-president; Joseph L. Sindeband, vice-president; Joseph 1. Graham, secretary and treasurer, and William S. Edsall, general sales manager. Directors, in addition to Messrs. Burnham and Sindeband, are William M. Flook, Allen Curtis, Edward N. Goodwin, William F. Ingold and Theodore G. Smith.

In addition to his duties as president of

Condit Electrical Manufacturing Corporation, Mr. Burnham has, during the last nine months, been assistant to the president of the American Brown Boveri Electric Corporation.

Toronto Contemplates Purchase of 110 Cars

Specifications have been prepared and bids will be asked on 110 new cars for city service in Toronto, according to Commissioner E. J. Lennox of the Toronto Transportation Commission. Recommendations will be laid before the Board of Control as soon as the necessary data as to prices. time of delivery, etc., have been assembled and considered. The new cars are expected to cost more than \$1,600,000, and payment will be made from the rehabilitation fund which has been accumulated for this pur-

Operating revenue has shown a consistent increase in the Canadian city over a period of years, and the new equipment will be provided to meet growing requirements and to provide necessary replacements. Practically all of the 950 cars owned by the Toronto Transportation Commission are in service during the morning and evening rush hours. While no details regarding the design of the proposed cars have been made available, it is understood that a number of them will be motor trail

New Trail Cars for Service Between Baltimore and Annapolis

Plans involving the expenditure of over \$250,000 to improve its passenger service on its North and South Shore divisions have been announced by Herbert A. Wagner, president, the Washington, Baltimore & Annapolis Electric Railroad, Baltimore, Md. Contracts have been placed with the J. G. Brill Company to build nine new trail cars which will embody many novel features making for passenger comfort and luxury. The new trailers will be constructed of steel and mounted on Brill 27 M.C.B. trailer trucks. The cars will be 58 ft. 1 in. long and will weigh about 60,000 lb. Windows will be of plate glass encased in metal sash. Scats will be provided for 38 passengers in the main compartment and 20 in the smoker. The seats will have double spring cushions, upholstered in brown Spanish leather. Cars will be electrically heated, with thermostatic control, and will be provided with a lavatory. Floor covering will be interlocking rubber tile of buff and green. Exterior finish will be the W.B.&A. standard green with gold lettering; interior trim will be in mahogany finish with ivory ceilings. Delivery is scheduled for July.

Plans also call for the complete renova-

tion of seventeen of the present motor cars so that they will conform in general design

with the new trailers.

Seattle Plans Work on Elevated Street Railway Trestle

With the ordinance passed and signed by the Mayor of Seattle providing for the removal of a large portion of the Whatcom Avenue elevated street railway trestle, the reconstruction of the existing section along West Spokane Street and rebuilding of a new section from East Marginal Way to First Avenue South, will proceed within the next few weeks. The trestle in its present state is considered unsafe, and approximately \$100,000 would have to be expended in repairs if its use is to be con-

pended in repairs it its use is to be continued, street railway officials have advised.

A. E. Pierce, chief engineer of the Municipal Railway estimates that the cost for reconstructing the existing section along West Spokane Street and the rebuilding of a new section from East Marginal Way to First Avenue South will be approximately \$100,000. The work will require about 215 tons of rail and 660,000 bd.ft. of lumber. The paving of First Avenue South, which will require 182 tons of rail, will cost approximately \$80,000.

New Shops for Cleveland Union Terminal

In anticipation of the opening of the Van Sweringens' new Union Terminal, which is scheduled for January, 1930, bids are being received by the Cleveland Union Terminals Company for the construction of an electric locomotive repair shop and two inspection sheds for electric locomotives. The repair shop and one inspection shed will be located in the Collinwood yards of the New York Central Railroad, where electric operation of the lines running into the terminal will begin. The other inspection shed will be located in the Linndale yards of the Big Four, where electrification is to end.

The repair shop building is to be of concrete, brick and steel construction, with oil proof wood floor and will be 223 ft. long and 171 ft. wide. It will contain one large room, with a balcony running around all four sides. Five tracks will run the entire length of the building; three of these will repair tracks, with pits beneath, one will be an oil wiping track, and the other a storage track for wheels and trucks. The shop will be equipped to handle work on ten locomotives. The balcony will contain rooms for a blacksmith shop, air compressor room, electric repair shop, offices, battery room, tool room, air brake room, motor generator and storage and locker rooms.

Each inspection shed will be steel and concrete, 198 ft. long and 39 ft. wide, with single tracks running through each side. The pits will be equipped with heating coils to thaw out locomotives during the winter.

Studebaker Makes Commercial Car Appointments

Appointment of three division commercial car representatives has just been announced by C. H. Wondries, manager of the Studebaker commercial car division. Each man has been assigned a specific territory and will work with the branch organizations in their respective territories in

promoting commercial car business.

J. L. Engels, formerly sales promotion manager for the commercial car division, has been appointed the Western division commercial car representative. His head-quarters will be at San Francisco and his territory that under the jurisdiction of the Portland, San Francisco and Los Angeles branches.

C. H. Miller has the Eastern territory with headquarters at Philadelphia. His territory includes the Boston, New York, Buffalo, Philadelphia, Washington, Pittsburgh and Cleveland branches. He was formerly the commercial car representative

for the Philadelphia branch. T. E. Connor, formerly commercial car representative for the St. Louis branch, has the Middle Western division. His territory includes the Detroit, South Bend, Cincinnati, Kansas City, St. Louis, Omaha, Chicago and St. Paul branches.

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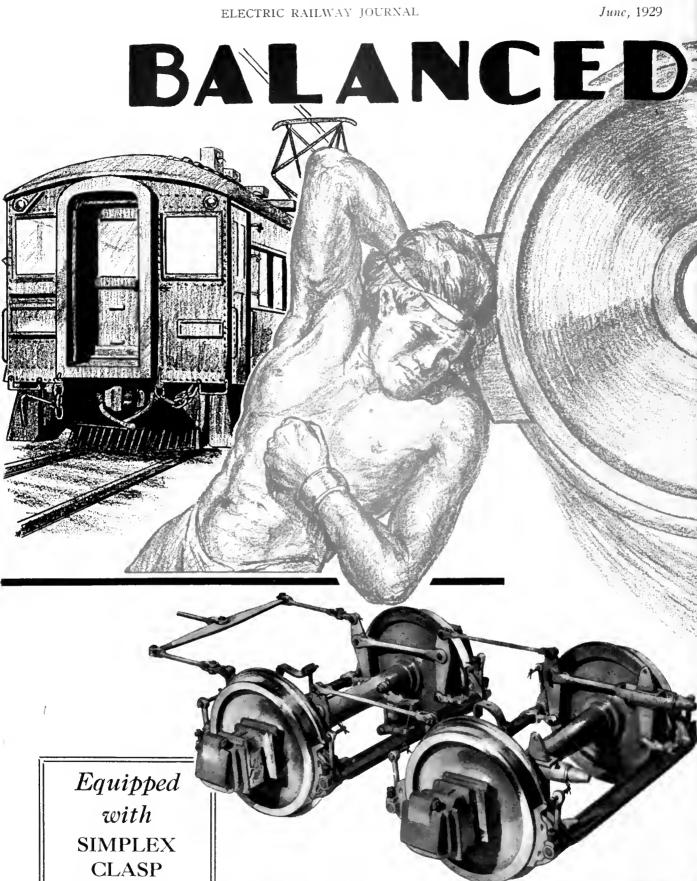
National Brake Company, Inc.

890 Ellicott Square, Buffalo, N. Y.

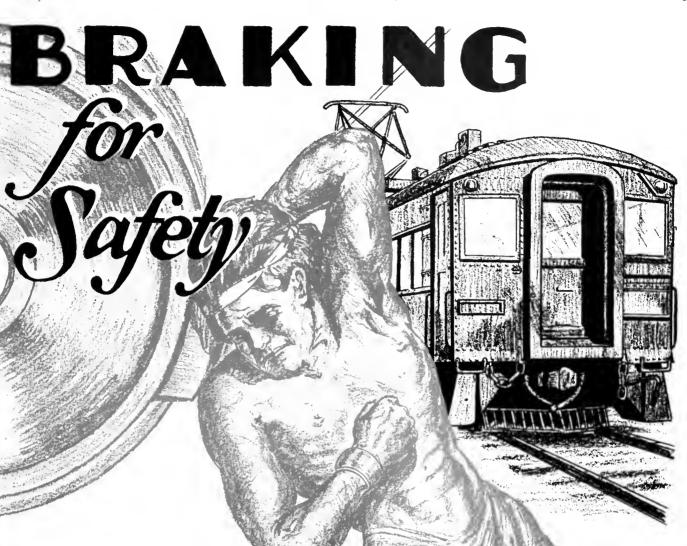
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Canadian Representative:

Lyman Tube & Supply Co., Ltd., Montreal. Can.



BRAKES A MERICAN



Increased revenue on the investment in new cars depends to a great extent on higher schedule speeds, which in turn requires quick deceleration. Braking is of the utmost importance for safety of operation.

Simplex Multiple Unit Brakes, with two brake shoes per wheel instead of one, offers the maximum retarding effect with the minimum of wear and tear on truck equipment. Clasp Brakes afford smoother braking with minimum heating of brake shoes, and less journal, journal box, and pedestal wear. Reduces brake and truck maintenance costs, another definite return in your investment in Modern Cars.

Specify Simplex Multiple Unit Clasp Brakes.

AMERICAN STEEL FOUNDRIES

NEW YORK

CHICAGO

ST.LOUIS

STEEL FOUNDRIES



And now— a "Canned" Sub-Station Ready for Use

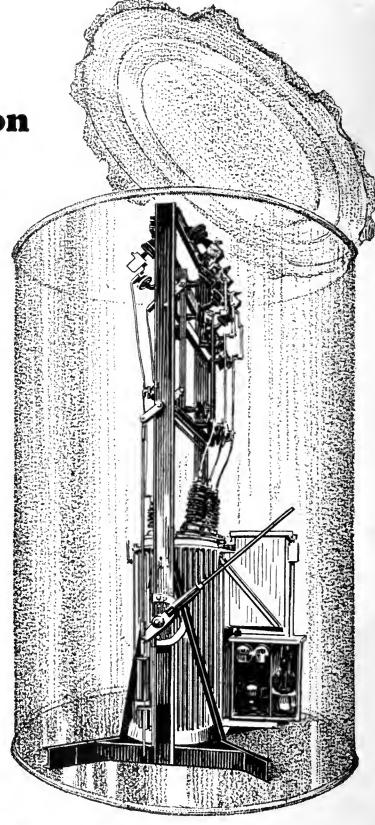
contents:, One power transformer, switching facilities, over-load and short-circuit protection, and means of metering.

DIRECTIONS FOR USE: Unload at point of intended installation and connect to transmission lines.



That's all!

The new



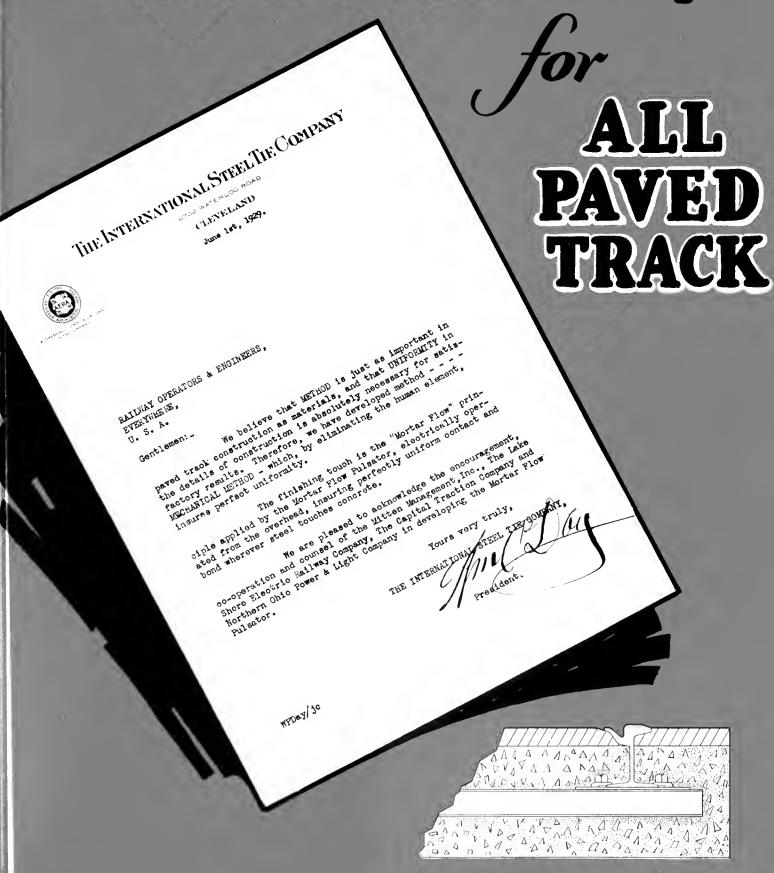
AMERICAN BROWN BOYERI Unit Sub-Station

AMERICAN BROWN BOVERI CO., INC.

Graybar Building, New York

Camden, New Jersey

International Recommends the MORTAR FLOW Principle

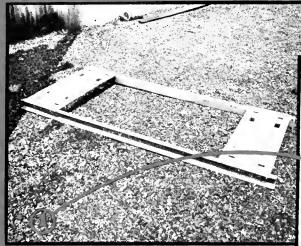


PERFECT CONTACT—PERFECT BOND

Wherever Steel Touches Concrete

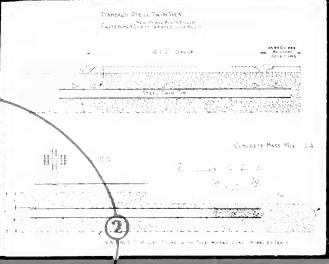
STEP-BY~STEP

THE STANDARD TWIN TIE



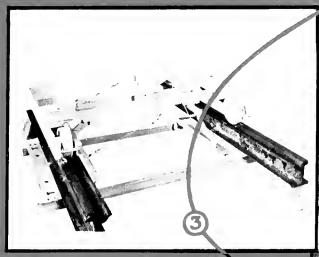
Largest effective hearing—well distributed weight—12 hot driven rivets—4 anchors bent down out of the plates—new heavy forged steel clips with heat treated bolts.

A HEAVY DUTY TRACK DESIGN



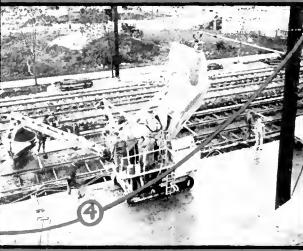
A heavy duty design with AERA Standard rail and asphalt paving for quiet operation—modifications fit any local condition. Note how the structure is sealed against water by the concrete around rail web.

MECHANICAL TRACK ASSEMBLY



With the D.S.R. Track layer, track assembly becomes a mechanical operation—the use of small cranes, truck or tractor type, is recommended for handling rail.

SPECIFY AND OBTAIN OUALITY CONCRETE



Minimum specifications for concrete for foundation should be 3000 lbs. per sq. in. The International methods of compression tamping and "mortar-flow" permit the use of stiffer mixes based on correct water-cement ratio with excellent results.

STEEL TWIN

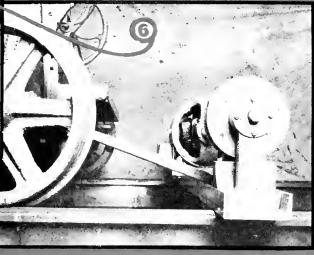
The Base of Modernization

METHODS to Uniform Quality Track

CONCRETE IS COMPRESSED WITH TAMPING MACHINE

Compression tamping insures good contact between tie plates, rail base and a compacted, non-porous concrete. This mechanical method of tamping insures uniform, perfect tamping of every foot of track.

THE "MORTAR-FLOW"
PULSATOR UNIFIES AND
SEALS THE WHOLE
TRACK STRUCTURE



The final step with the International method is the "MORTAR-FLOW" operation using the "MORTAR-FLOW" pulsator described below. (Protecting guards have been removed for the photograph.)

THE "MORTAR-FLOW" PRINCIPLE and THE "MORTAR-FLOW" PULSATOR

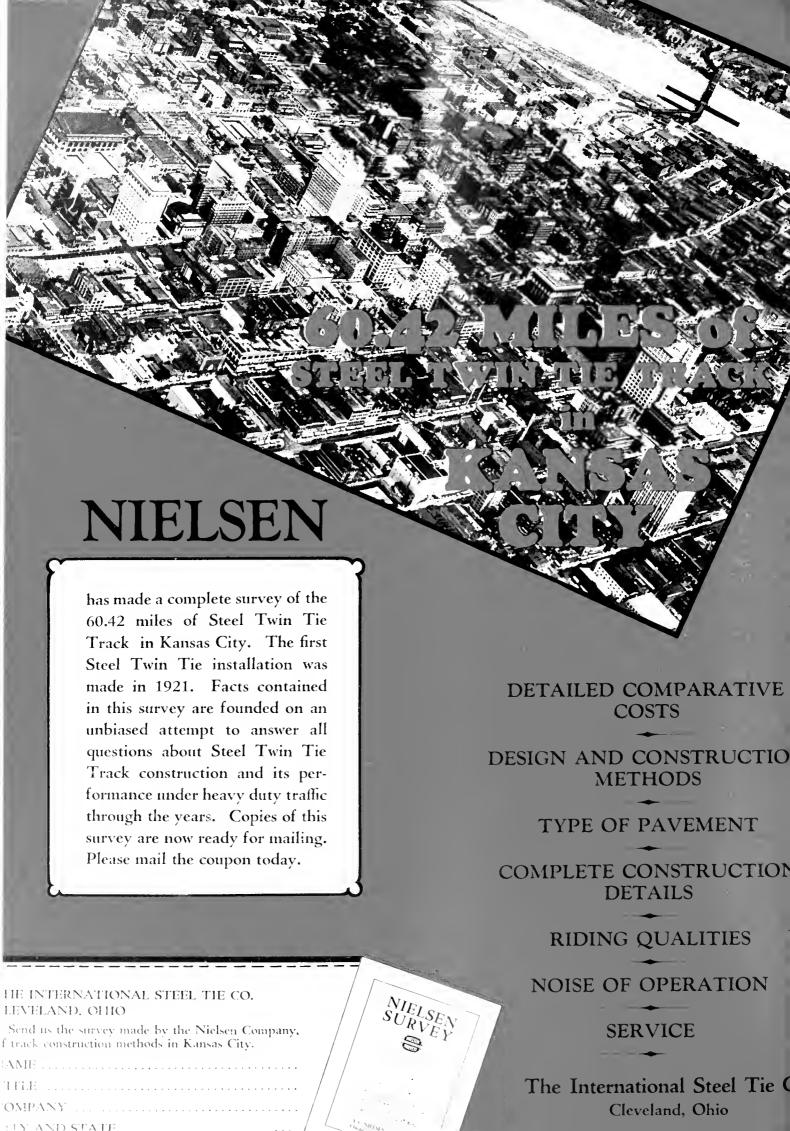
THE "MORTAR-FLOW" Pulsator is furnished attached to the compression tamping machine and is operated by the same man who does the tamping.

It is motor driven from the overhead with a 2 H.P. motor and rests directly on the rail, giving the track structure, mechanically, 4800 impulses a minute, causing a mortar flow which unites the steel of the rail and ties—and the concrete, in a perfect bond. While the pulsator is working air bubbles can be seen rising from the top along the sides of the rail. Test samples taken after concrete has set shows absolute bond between rail, tie and surrounding concrete, and absence of even minute air bubbles.

If you have a mile or more of paved track to build, we will welcome the opportunity to build at our expense, in your yard, a demonstration section for your inspection and analysis. We engage ourselves to let these methods and results speak for themselves, when you have arranged this demonstration.

TIE TRACK

Modernize the Track and the Methods



P

Consolidated Buzzer for Cars and Buses

The new buzzer gives a loud, clear cut signal which commands attention. The sound is transmitted to the molded base which acts as a sound box, thus permiting the use of a totally enclosed molded cover protecting the mechanism from dust and moisture.

As the exterior parts are made of molded material the buzzer is pleasing in appearance; and small in size. It is unusually rugged and simple in construction. The armature and contact strip are made of Swedish blued spring steel, and tungsten contacts are provided with a self-locking adjustment. Cover screws, terminals and adjusting screws are all accessible from in front.

One or two buzzers are used in series with standard fuse and resistance box for trolley voltage, or adapted for direct use on any battery voltage.



CONSOLIDATED CAR-HEATING COMPANY, INC.

The Repeat Key—

is one reason why you can load passengers faster with a National Fare Register



By making it possible to register repeat fares by pressing just one key, the repeat key on a National Fare Register does much to speed up service.



SPEED of operation is an outstanding advantage of the National Fare Register. With that speed comes faster loading of passengers.

Three features of the register—fast flexible keyboard, electric operation and repeat key—contribute to its speed.

The repeat key is used when two or more passengers board the car at the same point going to the same destination and paying the same fare.

After the first fare has been recorded it is only necessary to press one key, the Repeat Key, in order to register as many fares as desired.

Interurban operators have found

this key a distinct advantage and consider it one of the important features of the machine.

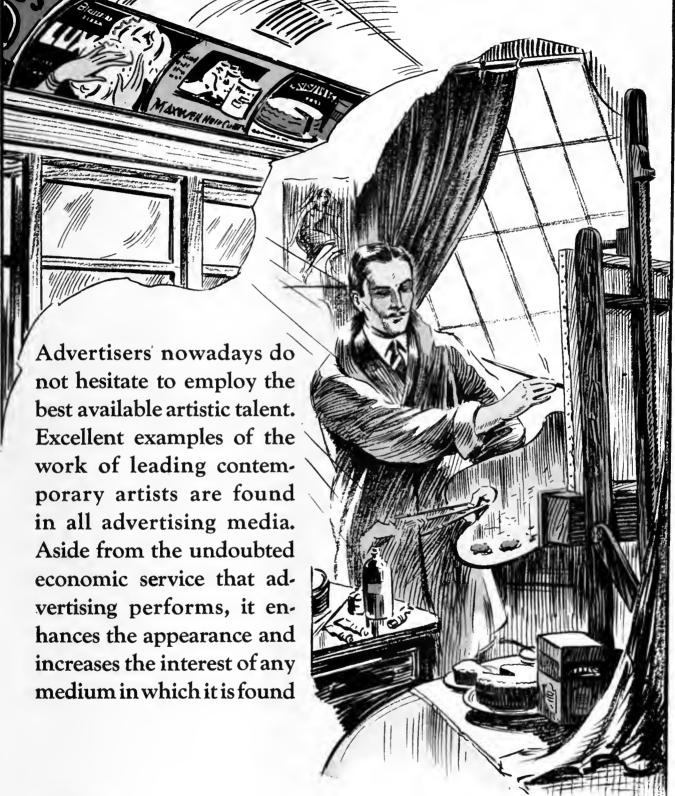
However, speed is not the only reason for the constantly increasing use of this register by interurban operators. Ten distinctive features make it the most advanced machine in the fare collection field.

Among these features are the large ticket printed and issued by the register, the printed trip sheet, the public indication, the fast keyboard and the small size of the register.

Each of these features contributes definitely to the successful operation of an interurban line.

THE NATIONAL FARE REGISTER

Product of The National Cash Register Company Dayton, Ohio



Barron G. Collier

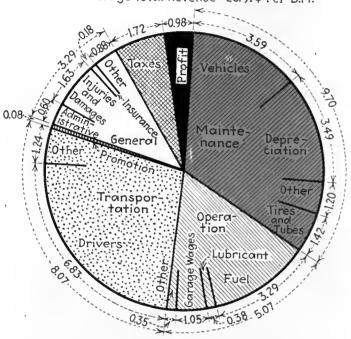
INCORPORATED NEW YORK CITY

Car Card Advertising Almost Everywhere

Longer

Mile

Average Total Revenue = 28.91¢ Per B.M.



Main operating accounts of 21 city companies with a total revenue of \$23,474,000

and REDUCED

EXAMINE the chart at the left. It shows that more than one-third of your company's dollars are spent for maintenance. Cut the maintenance cost and profits increase.

Most of the items under maintenance are for replacement parts. Many of these parts are worn out prematurely because of incorrect lubrication.

Cities Service lubrication engineers are experts in correct lubrication. For many years they have been helping some of the largest bus operators in the country to show greater profits. In many instances operating costs have been cut drastically through the use of Koolmotor Bus Oils.

Here are some of the things that Cities Service lubrication can do for you.

- 1. Reduce expenditures for replacement parts.
- 2. Reduce labor maintenance cost.
- 3. Reduce the frequency of repair periods.
- 4. Decrease road calls and delays.
- 5. Increase efficiency of vehicle operation.
- 6. Increase vehicle mileage life.
- 7. Increase net operating profits.

OIL DIVISION

CITIES SERVICE COMPANY

60 WALL STREET, NEW YORK, N. Y.

lge Life

MAINTENANCE COSTS

Koolmotor Bus Oils are refined from 100% Pennsylvania crude oil under special formulas to meet all the requirements of heavy duty, high speed motor bus lubrication. The scientific method used in refining accounts for their exclusive use by many of the largest motor bus properties in the country.



You can't afford to save money here

Buying lubricants on a quantity-price basis is like saving a dollar and losing a hundred. The cost of lubrication for the average electric railway system is only about a tenth of one per cent of the total operating cost. You can't save very much in any event—and the cost of poor lubrication is tremendous.

For every purpose, there is one most effective lubricant—and whether its price be lower or higher than another, that lubricant is the only one which can possibly give you the results you want. The right lubricants and their proper application save many a dollar.

These are specialized engineering questions — and Texaco provides the engineering skill, experience and line of products to meet them.

Texaco Car Oils, Texaco Crater Compound and other Texaco Lubricants are used on a large number of the electric railroads today. Many of the electric railways of the country are one hundred per cent Texaco lubricated.

Experience has provided the value of the kind of lubrication service and the kind of lubricant Texaco offers. Let us show you what Texaco lubrication is doing in the electric railway field. There is a Texaco representative nearby.

TEXACO LUBRICANTS

THE TEXAS COMPANY



17 BATTERY PLACE NEW YORK CITY



Well-Lighted, well-filled coaches. Well-pleased fares who enjoy reading comfort that makes the ride seem shorter... the service more friendly. Powerful headlights... searching the road ahead... revealing curve and danger spot... speeding the schedule. For this important lighting, an adequate power plant is vital... a capable generator, backed by a reliable storage battery. And hundreds of successful operators

have standardized on Exide Motor Coach Batteries. These rugged batteries are expressly designed for gruelling motor-coach service by engineers backed by forty-one years' experience of building batteries for every purpose. The Electric Storage Battery Company, Philadelphia. Exide Batteries of Canada, Limited, Toronto.





10,000,000 Goodyear Miles in YELLOWSTONE

The roads of Yellowstone National Park are bordered with Nature's magic. They open June 20th for another season of that wonderment which, once known, can never be forgotten.

Over their scenic reaches, as they climb and twist and dip, course the big sight-seeing buses of the Yellowstone Park Transportation Company, 269 eleven-passenger buses and 28 seven-passenger cars—all on GoodyearTires.

Easy-riding, on easy-running, elastic, cush-

ioning Goodyear Tires. Sure-footed, on the gripping, tractive, Goodyear All-Weather Tread. Safe, over the mountain highways of dirt and gravel and sharp volcanic glass, on strong, reliable Goodyear Tires.

For more than 10,000,000 miles, Goodyear Tires have delivered this faithful service through eleven seasons of the Yellowstone fleet's operation. For the last eight years, Goodyears have been the only tires chosen for this most particular duty.





Seat That Will Stand Abuse

Here is an ideal seat for your bus equipment. It is a high back, all leather chair, with a selected hardwood frame accurately joined and reinforced at all vital points by malleable iron braces. The 55 P Special will stand the hard usage which every bus chair is bound to receive, yet it is extraordinarily comfortable. It has spring-filled cushions over our deep, built-up spring construction and individual, spring-filled backs. The 55 P Special is mounted on double-clawed, malleable iron legs equipped with heavy rubber shock absorbers. Ask the nearest H-W sales office about this and many more of our modern, practical bus and railway seats.

HEYWOOD - WAKEFIELD COMPANY

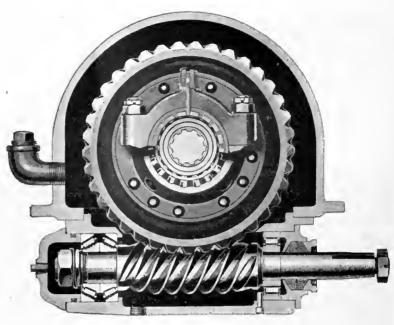
BOSTON, MASSACHUSETTS

516 West 34th St., New York City J. R. Hayward, Liberty Trust Bldg., Roanoke, Va. H. G. Cook, Hobart Bldg., San Francisco, Calif. 439 Railway Exchange Bldg., Chicago, Ill. A. W. Arlin, Delta Bldg., Los Angeles, Calif. The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada



If you have not received a copy of our new Bus Seat Catalogue, write for it.



Less noise please!

You don't question for a minute that quieter electric cars are more comfortable to ride in; and will induce more people to ride.

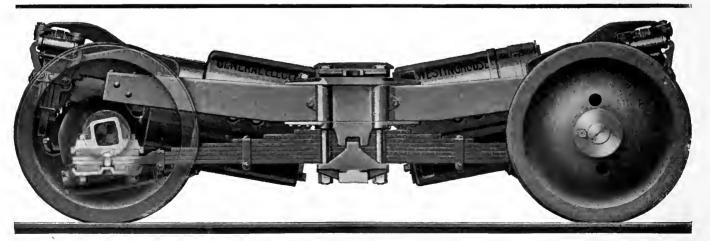
The vital contribution of Timken Worm Drive to electric railway performance and profits is Reduction of Noise.



The "plus" value is much lower weight, reduced operating cost, prolonged life of equipment, smoother starting and stopping.

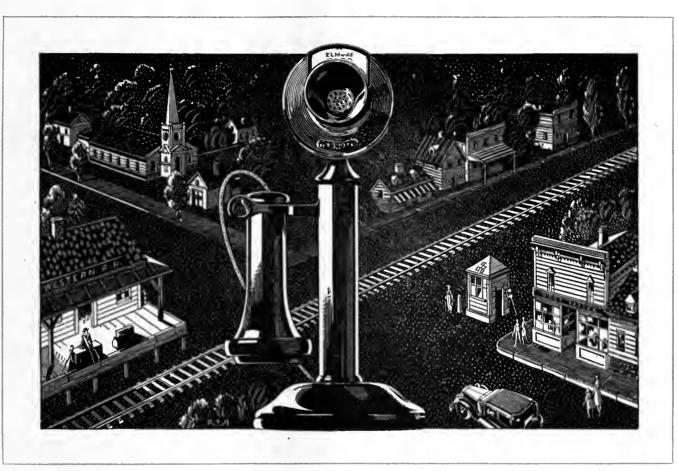
THE TIMKEN-DETROIT AXLE COMPANY, Detroit, Mich.

TIMKEN WORM DRIVE TRUCKS



FOR ELECTRIC RAILWAY CARS

Stranded in a Small town . . . He kept both Engagements by Telephone



A PLANT superintendent of a large tire company was on a business trip in Canada. He missed his connection and was stranded in a town with one train a day. Two important engagements loomed ahead—one in Toronto, the other in New York. He thought of the telephone. He called the two cities. He completed his business so satisfactorily in both places that neither of the trips was necessary.

The telephone is always ready to put important things through. A man in St. Louis was too busy to go to Memphis and back. He made the round trip by telephone. It resulted in \$1400 worth of business.

A Seattle lumber company received a carload order on condition that it could be shipped in five days. Special items had to

be cut. A telephone call to Portland, costing \$1.15, found a mill that could do the work. The car was shipped in time.

A Minnesota commission house invested \$43.60 in nine Long Distance calls to five cities and sold 60 carloads—\$24,840 worth—of potatoes.

What delay, worry or expense could you save today? Is there a misunderstanding to be adjusted, an important sale or purchase hanging fire? Calls are cheap.

Typical station to station day rates: Chicago to South Bend, 6oc. Peoria to St. Louis, 9oc. Cleveland to Philadelphia, \$1.60. Pittsburgh to St. Louis, \$2.35. Boston to Chicago, \$3.25.

Out of town calling is quick and calling by number takes even less time. Bell Telephone Service. Quick. Inexpensive. Universal.



It raised their

-and it <u>lowered</u> their maintenance cost



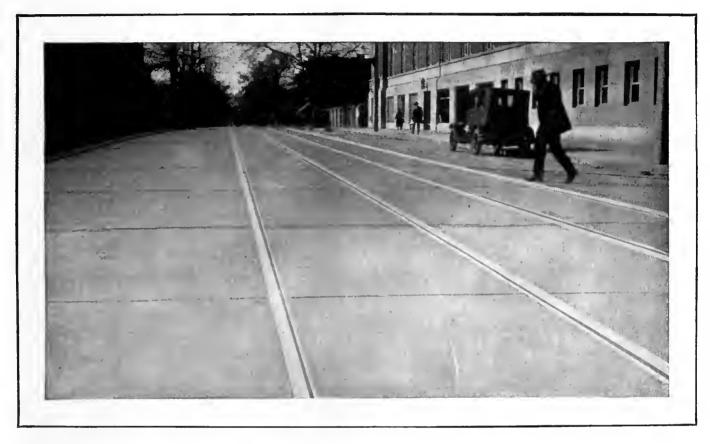
Carey Elastite System of Track Insulation is a preformed asphaltic compound, reenforced with asphalt-saturated fibres. Made to fit any rail section; easily installed, in any weather.



TO give Richmond's car-riding thousands the utmost in comfort and service, The Virginia Electric & Power Company has made many radical departures from old methods of track construction.

And one of their most progressive steps—an improvement instrumental in bringing to Richmond the Coffin Award for electric traction progress—was the installation of a lastingly resilient cushion between the rails and the paving. Thousands of lineal feet

standards of service



of rail filler—Carey Elastite System of Track Insulation.

Carey Elastite System of Track Insulation! Defense against pumping at junctions and joints; noise reduction; easy rid-

ing, smooth operation, lowered maintenance cost. If you are planning any track construction work, certainly you will want the facts on this advanced traction development. Write.

Showing the installation of Carey Elastite System of Track Insulation on The Virginia Electric & Power Company's trackage, at Richmond, Va. The pavement is asphalt-grouted brick, on a concrete base.

THE PHILIP CAREY COMPANY, Lockland, CINCINNATI, OHIO



over

\$1,000,000.00

worth of

"TOOL STEEL" Gears and Pinions

were specified and bought for

New Equipment in the last eight years

in North and South America-England, Holland, Italy, Spain and Australia.

"TOOL STEEL" Gears have proved vastly superior in quality in test after test, and railway lines now realize it pays to buy the best on their new equipment. You would not think of buying a motor to last only a few years—why get a short life gear?

It pays to specify "Tool Steel" Gears.

THE TOOL STEEL GEAR & PINION CO. Cincinnati, Ohio



Maintenance_the Profit Eating Glutton

Painting of motor buses and street cars is the part of the great maintenance problem for which Mahon engineers offer a definite solution. ¶It has been proved that spray painting methods, with proper equipment and facilities, and the use of Duco or similar fast drying finishes, will cut 50% off the "Out of Service" time required for refinishing buses and street

cars with the old hand-brush method . . . can you conscientiously ignore this fact? ¶Mahon engineers will gladly give you detailed information and will cooperate with you in the design and arrangement of spray painting equipment in your paint shop . . . the council of this highly specialized staff of Spray Booth experts is of inestimable value to you. Write today.

THE R.C.MAHON COMPANY DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial
Drying Ovens and Blow Pipe Systems

MAHON

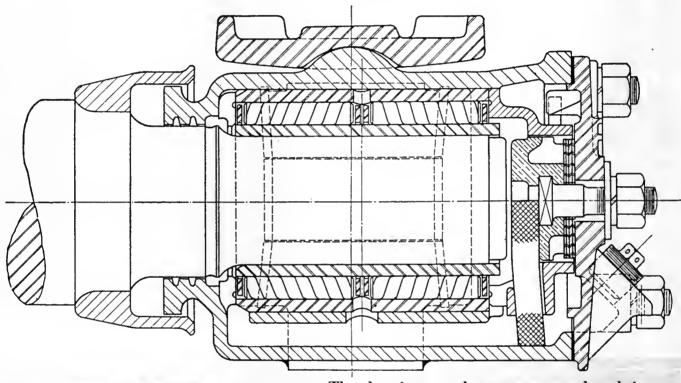
SPRAY BOOTHS & EXHAUST STACKS

- DESIGNED FOR FIRE SAFETY -

PROVED BY Performance

IN every section of the country there are properties with Hyatt Roller Bearing equipped cars in operation, and service records prove the bearings are giving a splendid account of themselves. A sectional view of the Hyatt Roller Bearing Journal Box now available for standard A. E. R. A. pedestals is shown below.

Note the spring seat rocker, which lends flexibility to the mounting and compensates for spring irregularities. This rocker construction may be altered to suit varying truck design.





Details on box sizes and capacities may be had by writing the nearest Hyatt office

The bearings and raceways employed increase bearing capacity. Every detail of the box design is engineered to give longer life and the carefree service you expect of antifriction bearing applications.

Electric railway companies desiring to save power, reduce maintenance, and increase comfort of passengers are modernizing with Hyatt Roller Bearing Journal Boxes. The Hyattway is the Saving Way.

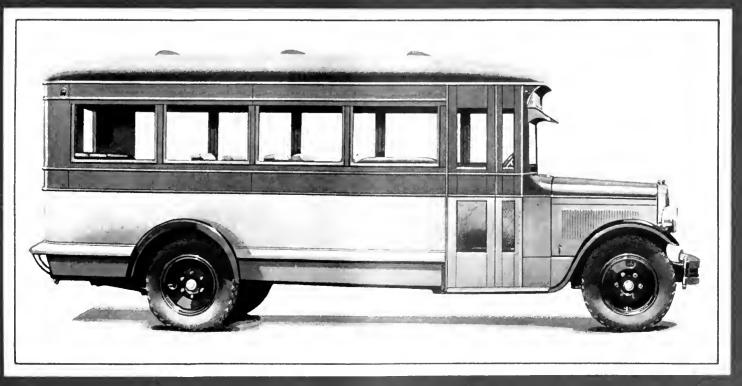
HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland



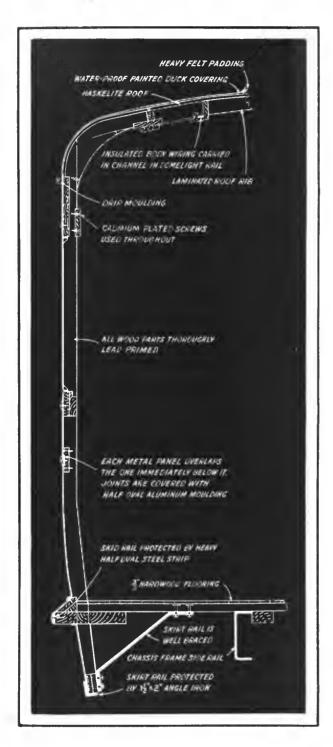
ROLLER BEARINGS

MAINTENANCE ...SIMPLIFIED

Motor coach operators know this: Every motor coach will have its turn in the shop. Sooner or later, repairs and adjustments are inevitable. ¶Dodge Brothers Motor Coaches are not exceptions. But so well have they been designed and built to weather the strains and stresses of even the most arduous service that their turn in the shop is postponed until long beyond the normally expected date. ¶They are built to serve dependably, to win patrons by their comfort, their safety and their good appearance and to please operators by their ability to work at uniformly low cost—mile after mile, year after year.



These Features Mean



ROOF, of Haskelite, supported by laminated ribs is strong and weave-proof. It is covered with waterproof painted duck. Heavy felt padding between top covering and wood effectively protects the covering.

INSULATED BODY WIRING is carried in channel in dome-light rail. Greater protection and ease of access result.

DRIP MOULDING is amply deep and of heavy construction. It provides the needed protection to insure efficient drainage in all weather.

CADMIUM PLATED SCREWS, exclusively, are used in construction of body. These rustresisting screws prevent premature destruction of the wood at points used.

ALL WOOD PARTS are of oak and are thoroughly lead primed. As a result of this treatment, body will endure for a far longer period.

EACH OUTSIDE METAL PANEL overlaps the one immediately below it. All joints are covered with half-oval aluminum moulding. Such care in design and construction insures more effective weatherproofing, a more finished appearance and longer, care-free life.

SKID RAILS, on sides and rear of coach, are a unique feature. These sturdy guard rails provide added safety for passengers and material protection to body through elimination of costly repairs resulting from minor accidents.

SKIRT RAIL is securely braced and adequately protected by sturdy angle irons. Long body-life and protection in even unusually severe coach service, are assured.

WINDOWS are of brass sash with pinch locks operating on brass slides and free from rattle,

Add to this list of advantages such motor coach essentials as metal nonskid entrance step, removable safety mat in aisle and genuine leather seats of sturdy, enduring construction. Body maintenance costs are sure to be low.



DODGE



CHRYSLER MOTORS PRODUCT

SOLD BY DODGE BROTHERS

Low Maintenance Cost

CHASSIS is clean, sturdy and simple in design—easily accessible for adjustments or repairs. Note the absence of complicated brake linkages, rods and cables.

RADIATOR is of the honeycomb type, with shutter controlled from driver's seat. Watertemperature indicator on instrument board and thermostat in engine provide additional temperature control for economical operation.

TRANSMISSION is of the heavy-duty type with four speeds forward. It provides that irresistible pull of the low low for hole or hill and speed where conditions permit. It is built to withstand the constant, gruelling service demanded by bus operators today.

STEERING, easy, quick and certain, is insured by the sturdy nut and lever steering gear. Simplicity and rugged design make maintenance negligible.

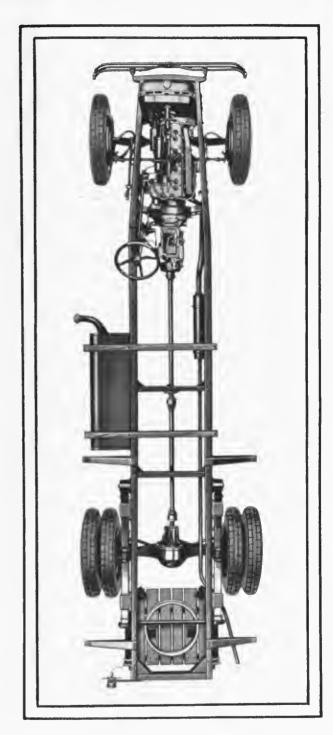
REAR SPRINGS of the 3-stage, progressive type, provide surpassing riding comfort for passengers—whether load is light or heavy. Flexibility, without sacrifice of strength, is assured with varying loads by the progressive action of each of the three spring sections.

BRAKES, safe, 4-wheel hydraulic with American Brakeblok linings, are large, certainin-action, long-wearing and require but the minimum of periodic attention.

ENGINE, Dodge Brothers 6-cylinder, furnishes a smooth flow of power for the most exacting demands of coach service. It is designed and built with special thought to the needs of those users who seek simplicity, economy and long life.

CRANKSHAFT in the Dodge Brothers engine is of the 7-bearing type weighing 69 pounds and with a total projected bearing area of 28.36 square inches.

Weigh well the importance of these and numerous other chassis refinements such as oil filter, air cleaner, gas filter and crankcase ventilator. They help materially to lower maintenance costs.



BROTHERS

DEALERS EVERYWHERE

Service

Wherever and Whenever Needed

When Dodge equipment does require adjustments or repairs, a Dodge Brothers Dealer is close at hand. Service—prompt and expert—is always available. Or if the operator maintains his own service facilities, parts—reasonably priced—are obtainable without delay.

To operators of Dodge Brothers Motor Coaches upkeep is not a bugaboo. Maintenance they recognize as eventually necessary. Maintenance, low in cost, they are sure to get when it is finally needed.

DODGE BROTHERS MOTOR COACHES

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

GOOD APPEARANCE



of Both Single and Dual Wheels on Trucks and Buses



GOODYEAR TYPE "K" RIMS

Besides strength, ease of operation and proved merit mechanically, Type "K" Rim Equipment excels in appearance

WHEN you look over a finished truck or bus, your attention is powerfully drawn toward the wheels. Type "K" Rim equipment plainly indicates both strength and smartness—a touch which is not lost upon fleet owners who want the very best. This is one of the reasons why manufacturers of trucks and buses in increasing numbers are specifying Goodyear Type "K" Rims.

Goodyear Type "K" Rims are quickly and easily demountable and remountable, both because of their mechanical features and their light weight. They slip off and on with ease despite rust, dirt, ice, etc.

They are interchangeable. They have strength with their light weight. They are cool-running. And they are the only single bevel rim on the market today with an 18° bevel.

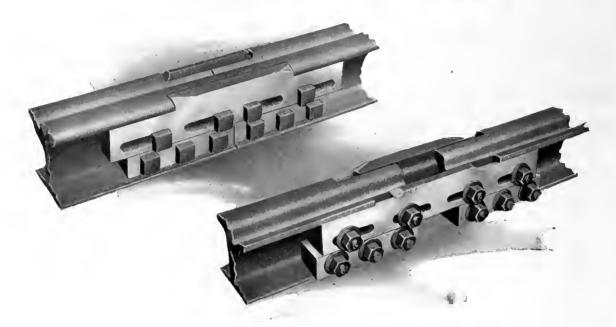
Write today to Goodyear, Akron, Ohio, or Los Angeles, California, for detailed information. If you are a truck, bus or trailer manufacturer, Goodyear offers you every co-operation of its engineering staff

"The man who changes the tires likes Goodyear Type 'K' Rims"



Type "K" Truck & Bus Rim Equipment

LORAIN



Expansion Joint

Pittsburgh Railways Company's Standard

THIS type of joint is extensively used, particularly on bridges, and consists of an outside or head bar, which is made of manganese or other alloy steel, a tram side bar, which is cast steel, four steel flange blocks, two rails and necessary bolts.

This illustration shows short pieces of rail, but these rails are furnished in lengths as desired, usually 8 feet each. The extreme ends of the rails are drilled for standard joints and the expansion ends are specially machined, to accommodate the expansion bars and provided with round holes for the through bolts.

The four flange blocks are bolted permanently to the rail ends, and the head and tram bars are provided with slotted holes to take care

The upper illustration shows the joint practically closed while the lower shows it partly open. This joint takes care of expansion up to $3\frac{1}{2}$ inches.

Girder Rails

Girder Guard Rails

Plain Girder Rails

Rail Joints and Track Accessories

Expansion Joints for Electrically Welded Track

Special Trackwork

Switches, Frogs and Crossings

Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail

The Lorain Steel Company

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

Illinois Steel Company Minnesota Steel Company National Tube Company CARNEGIR STEEL COMPANY CYCLONE FENCE COMPANY FEDERAL SHIPBUILDING AND DRY DOCK COMPANY

UNITED STATES STEEL CORPORATION

THE LORAIN STEEL COMPANY TENNESSEE COAL, IRON & R. R. COMPANY UNIVERSAL PORTLAND CEMENT COMPANY * Pacific Coast Distributors—United States Steel Products Company, San Francisco, Los Angeles, Portland, Seattle, Hooolulu. Export Distributors—United States Steel Products Company, New York City

Sales Offices:

PHILADELPHIA

PITTSBURGH

Dependable Ser

ATLANTA

Quality Products

AMERICAN BRIDGE COMPANY

AMERICAN SHRET AND TIN PLATE COMPANY AMERICAN STEEL AND WIRE COMPANY

CHICAGO

CLEVELAND

DALLAS

NEW YORK



White 18 to 21 Passenger Six-Cylinder Bus, Model 65

A Powerful New White 6 Cylinder 18-21 Passenger Bus

BUILT to satisfy completely the requirements of the bus operator for a quality bus seating from 18 to 21 passengers, the new White six-cylinder, Model 65, will deliver maximum performance under all operating conditions. It combines beauty of line with the practical advantages of economy of operation and convenience in maintenance and inspection. All parts are unusually accessible.

Because of its extreme flexibility, Model 65 with 21-passenger pay-enter body is especially adapted for use where traffic conditions are severe and with body seating from 18 to 21, for use in inter-city service where exceptional performance is desired. By the addition of four aisle seats capacity may be increased to 25.

The new White Six Bus is White built throughout. In design it is balanced and soundly engineered, possessing many advanced mechanical features including a rugged six-cylinder overhead valve, seven bearing crankshaft engine, double ignition system and 4-wheel Lockheed hydraulic type brakes with a Westinghouse vacuum operated Servo built integral with the hydraulic Master cylinder. The combination assures equalized, powerful and smooth braking.

Performance and profit have built up the solid prestige back of White Bus leadership. This latest addition to the White Bus line, Model 65, also assures the maximum of comfort and safety to the riding public and the maximum of profit to the operator.

THE WHITE COMPANY, Cleveland

WHITE BUSSES

FOURS AND SIXES

Aluminum Busbars give lower costs

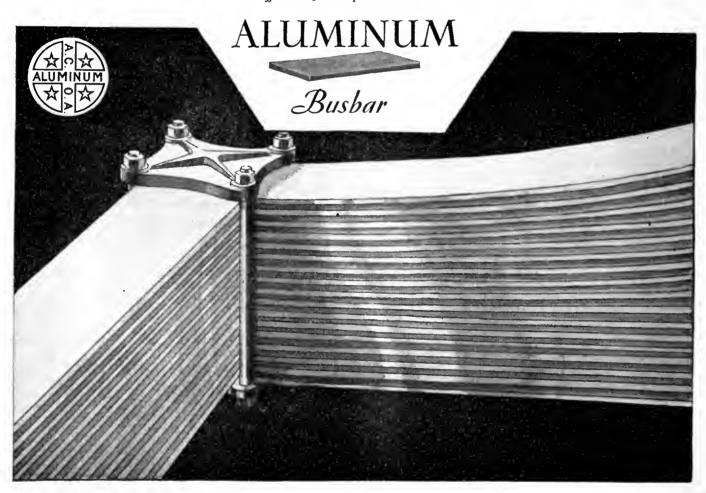
THE lower first cost of Aluminum Busbars is a matter that may well receive the consideration of designing engineers.

For the handling of power at a large station the adoption of Aluminum Busbars develops an initial saving that appreciably affects the relation of operating profit to equipment investment.

To this important economic factor may be added lighter weight, with structural economy and complete dependability.

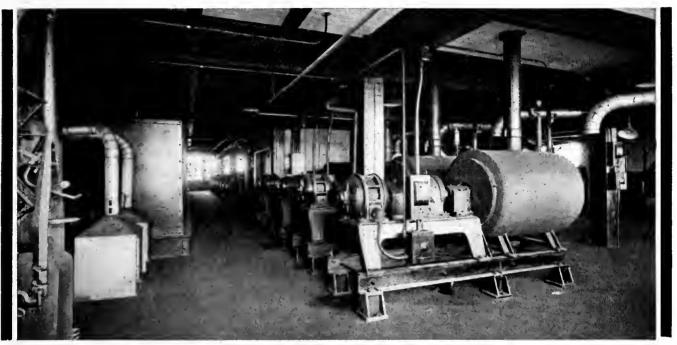
A booklet setting forth Carrying Capacities, Joints, Deflections and Stresses, Specifications and Tables will be forwarded upon request.

> ALUMINUM COMPANY OF AMERICA 2463 Oliver Bldg., Pittsburgh, Pa. Offices in 19 Principal American Cities





CARBON is just a start



Section of milling and mixing department

YOU might suppose that after we had secured our carbon in a form such as graphite or lampblack there would be nothing else to do but mould it into brushes in a single pressing operation, and attach shunts, if required, in another.

But brush manufacture is not so simple as all that, or you could make your own brushes. Brush making is a highly specialized, technical task, requiring long experience, great skill, and the expenditure of large sums for research, scientific apparatus and factory machinery. Of these, experience and skill are the hardest to obtain. Our 52 years in the manufacture of carbon products has given us this experience and skill.

No, carbon flour is just a start. The next manufacturing step is mixing. The identities of the various grades are established at this time. The lampblack or other form of carbon flour is mixed with tar or pitch in special mixing machines that

handle carefully measured amounts of these materials according to the grades required and produce a mixture whose characteristics are held within close limits by the laboratory.

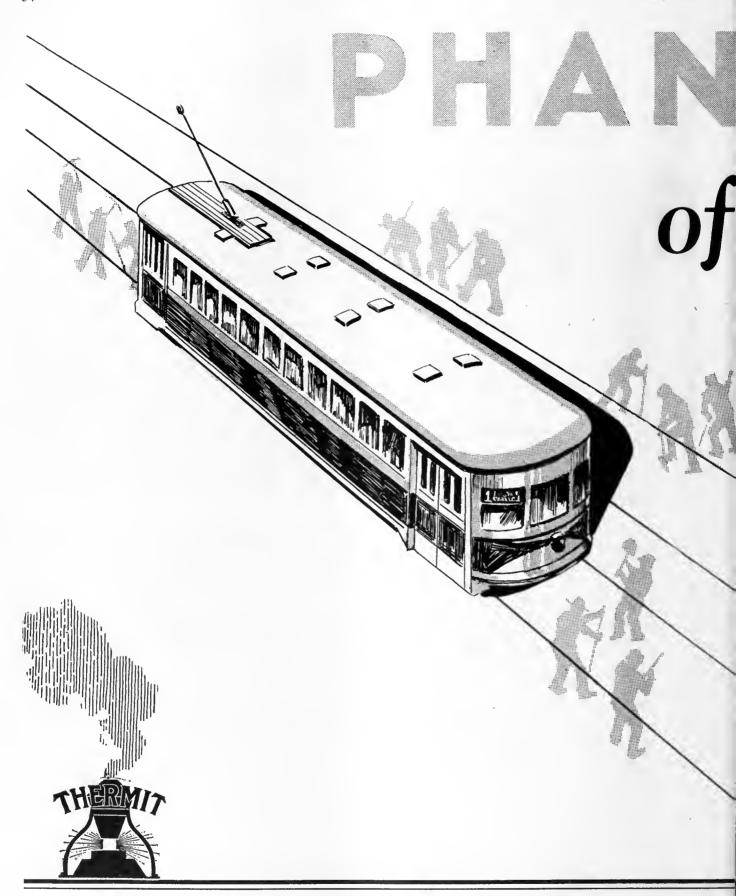
The mixing process is one of the most important steps in brush manufacture. There are many points in this operation where scientific control is exercised to assure the desired characteristics in the finished brushes.

At the completion of this process 39 days have passed and there are still many operations through which this material must pass before it can reach you as a finished brush.

But National Pyramid Brushes finished exactly to your specifications can be shipped you promptly on order. They are sawed and ground from blocks that already have gone through our long, intricate manufacturing processes. This gives you a perfect carbon brush, made to exact size, quickly.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.





METAL

8

THERMIT

PITTSBURGH

CHICAGO

BOSTON

the past!

Gone are the rail joints of pre-Thermit days. Gone also are the men and machines that dug the pavement up and patched those joints.

Now traffic on the crowded city streets flows evenly along and cars speed smoothly over jointless track.

Those men,—those joints,—those holes—are but phantoms of the past.

What this all means to transportation companies is hardly worth repeating here. That Thermit welding has brought this about is known by every operating man.

And yet it costs surprisingly little to Thermit-weld all joints out of existence, far less in fact than to patch them and to keep them patched.

If track and rolling stock repairs are gnawing at your profits, think well before you patch, and Thermit-weld instead.



CORPORATION

NEW YORK, N.Y.

SOUTH SAN FRANCISCO

TORONTO

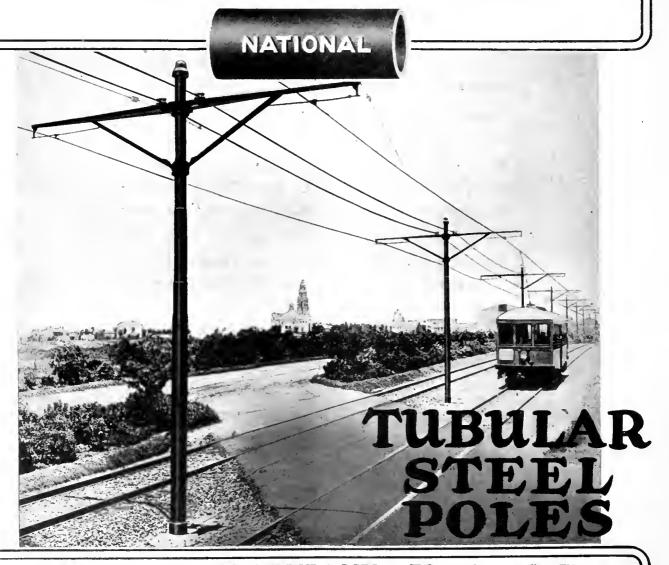
Preference from this standpoint

GENERAL dependability, the necessary factor demanded today in line poles, is represented in a high degree in "NATIONAL" Tubular Steel Poles—the principal reason for their preference by leading traction companies throughout the country.

Made by the largest manufacturer of tubular products in the world, by skilled workmen under expert supervision; put through severe tests which represent the hardest kind of service conditions—"NATIONAL" Poles include the desired advantages of durability—strength—low upkeep—and attractiveness—which make up general dependability in service.

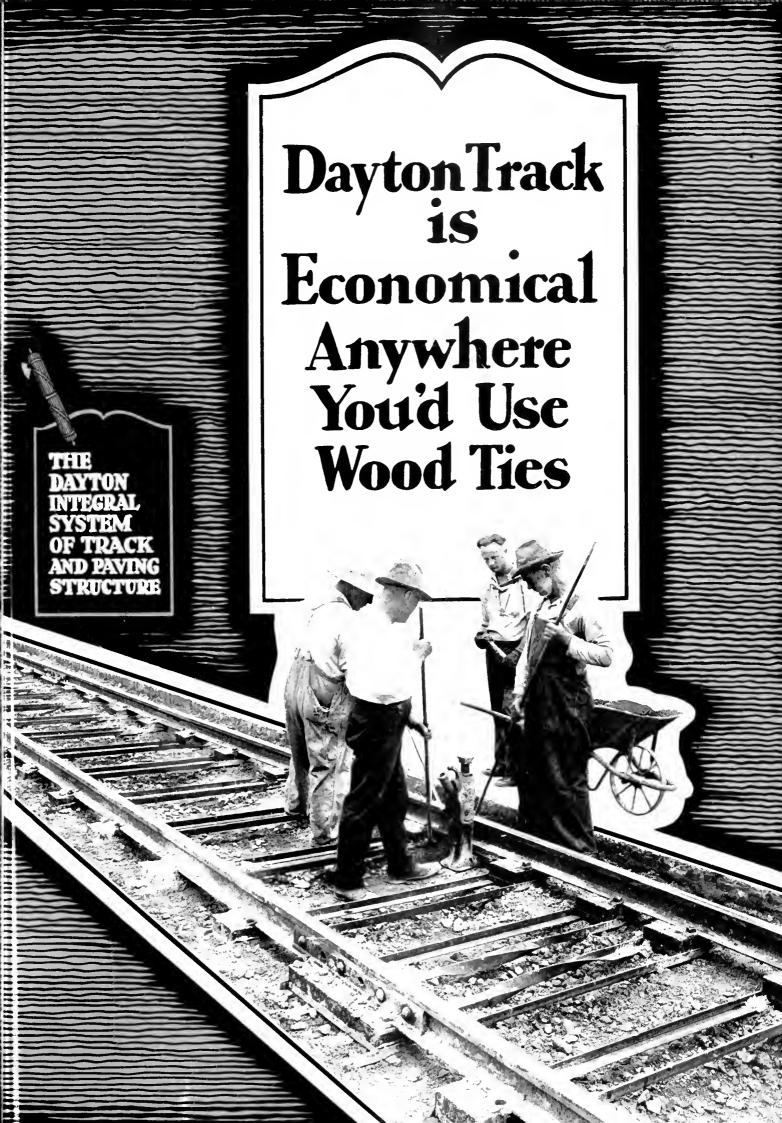
For additional protection against atmospheric corrosion use "NATIONAL" Copper-Steel Line Poles. Steel containing a small percentage of copper makes it especially resistant to this type of corrosion.

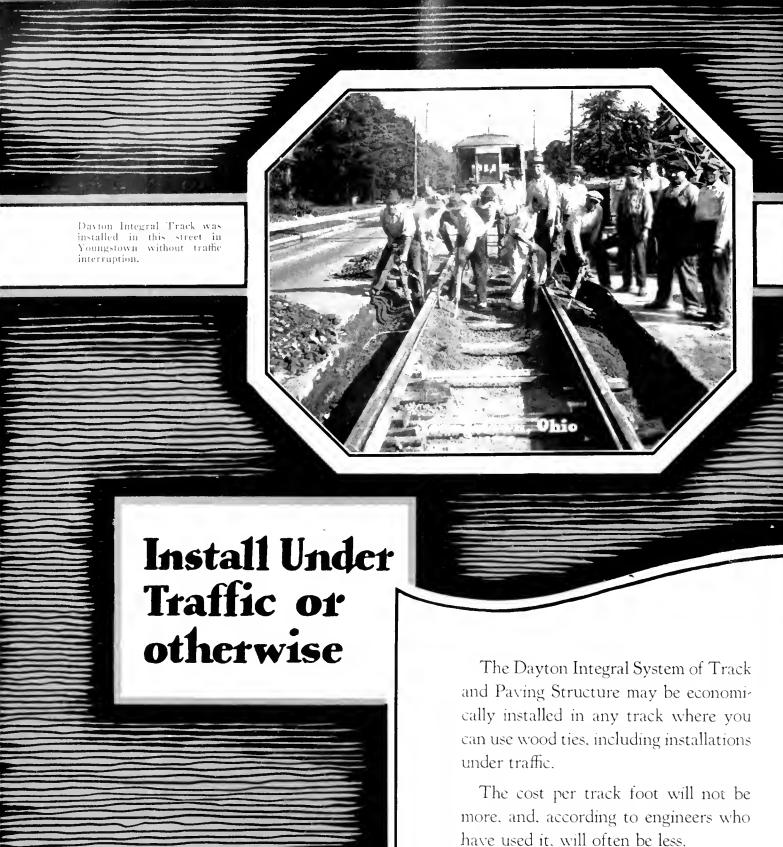
Note in the illustration below the clean-cut, neat appearance which "NATIONAL" Poles give to this electric line. Our engineers will be glad to cooperate with you and offer suggestions concerning installation of these poles. Bulletin No. 14—"NATIONAL" Tubular Steel Poles—and Bulletin No. 11—Copper-Bearing Steel Pipe—will be sent upon request.



NATIONAL TUBE COMPANY · Pittsburgh, Pa.

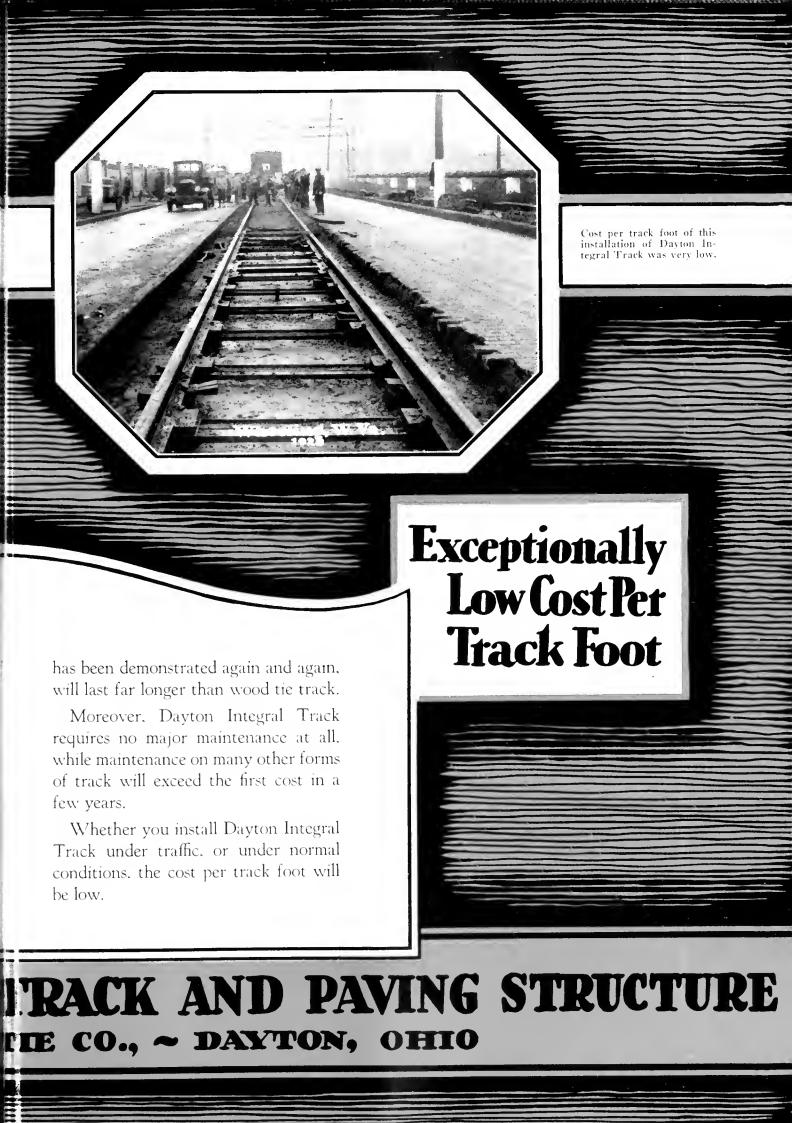
Subsidiary of United States Steel Corporation

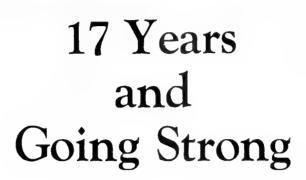




And you can spread your appropriation farther. Dayton Integral Track, as

THE DAYTON INTEGRAL SYSTEM OI THE DAYTON MECHANICA





The life of track built by the Dayton Integral System of Track and Paving Structure is so long that our 17 years in business has not established its limit.

But even better, it requires no major maintenance at all. It gives you good track that stays good with little or no expense.

Sometimes the life of inferior track may be prolonged, but only at a maintenance cost which in a relatively short time amounts to more than the original track cost. In such case it is more economical to lay new track—Dayton Integral Track.

Dayton Integral Track unifies track and paving foundation into a single, sturdy structure, provided with a vibration absorbing element which protects the concrete against destruction. The Dayton Tie also provides re-enforcing for the concrete which greatly augments strength.

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



-Contacts with Rail on Thin line - placing Bond low on Rail head.

Produce Outstanding Performance

The Arc weld bond was introduced ten years ago. Its design, developed from actual experience, won the ap. Proval of many traction companies. Since then, it has been steadily grow. ing in favor because it is built to with. stand hard usage and give long satis. factory service. Arc weld bonds have proved you can rely on them.

E COMPAN

Subsidiary of United States Steel Corporation

208 S. La Salle Street, Chicago

Other Sales Offices

Boston Cleveland Worcester Philadelphia Pittsburgh Buffalo Detroit Cocinnati Baltimore Wilkes-Barre St. Louis Kansas City Minneapolis-St. Paul Oklahoma City Birmingham Atlanta Memphis Dallas Denver Salt Lake City U. S. Steel Products Company: San Francisco, Los Angeles, Portland, Seattle Export Distributors: United States Steel Products Co., 30 Church St., New York

208 S. La Salle Street, Chicago

30 Church St. New York

Buffalo Detroit Cocinnati Baltimore

Salt Lake City

U. S. Steel Products Company: San Francisco, Los Angeles, Portland, Seattle Export Distributors: United States Steel Products Co., 30 Church St., New York

The Radiance of Anality



1878

1929

POR over fifty years The Okonite Company has persisted in an unvarying policy of maintaining the highest Quality in all of its products.

This quality has been outstanding, and known the world over for its consistency and the reliability of performance imparted by it to everything bearing the Brand of Okonite.

To a quality, always unequivocally guaranteed, has been added an intelligent, attentive Service functioning far beyond the plane of merely selling factory output.

As a result, Okonite users have enjoyed the comfortable and profitable experience of freedom from disastrous and costly plant failures, receiving thereby a proper return on their wise investment in Quality.

The good name of The Okonite Company has been established by an adamantine resistance to every pressure for lower standards; by constantly keeping faith with all customers; and by the broad desire to do its full part in the successful building up of the electrical industry.

This Radiance of Quality lights the way for future work, remindfully emphasizing that the performance of electrical equipment is assured by its quality.

THE OKONITE COMPANY

THE OKONITE-CALLENDER CABLE COMPANY, INC. FACTORIES: PASSAIC, N. J. PATERSON, N. J.

SALES OFFICES: NEW YORK CHICAGO PITTSBURGH ATLANTA BIRMINGHAM SAN FRANCISCO LOS ANGELES Novelty Electric Co., Philadelphia, Pa.

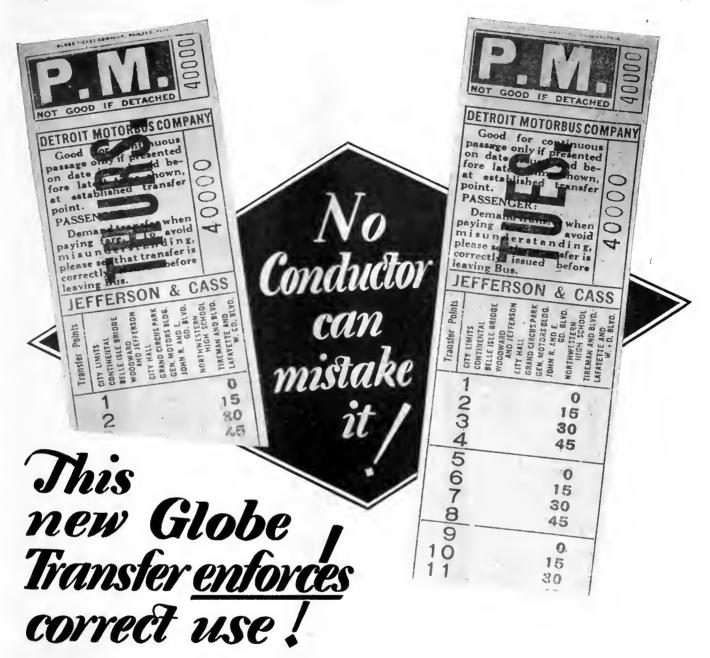
PITTSBURGH ST. LOUIS BOSTO LOS ANGELES DALLAS SEATTL

F. D. Lawrence Electric Co., Cincinnati, O.

Canadian Representatives: Engineering Materials, Limited, Montreal Cuban Representatives: Victor G. Mendoza Co., Havana







Operators using this "Tear-Off" transfer report that the abuse of privileges is practically negligible. This type of transfer is particularly adapted to one-man cars.

The conductor issuing the transfer tears it off at a figure which indicates the correct

time privileges. For each hour, the trans-

FACTORIES

PHILADELPHIA
NEW YORK
BOSTON
LOS ANGELES
JACKSONVILLE, FLA.

fer length increases, so that any attempt to pass with an earlier transfer is instantly noticeable, even in rush hours. The older method of punching was less accurate, took more time, and encouraged fraud.

Call any Globe Office for particulars on any paper fare col-

lecting system.

Globe TICKET COMPANY

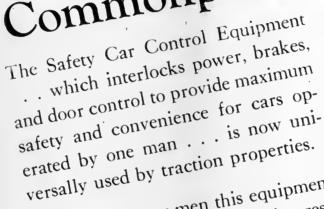
112 North Twelfth Street PHILADELPHIA

SALES OFFICES

BALTIMORE CINCINNATI CLEVELAND PITTSBURGH SYRACUSE, N. Y.



Common-yet not Commonplace



To street railway men this equipment is familiar, yet not devoid of interest. It still attracts attention by virtue of its contribution to safe, speedy, and economical transportation. Its potentiality for improvement in service and public goodwill is being recognized more extensively from year to year.



"Canned Experience". Make use of the other man's experience

That old saying

That old saying

about experience being the But

about experience without be of

teacher is about it without be

teacher is recite as your you

most har orst well as our you

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the advantage of the experience

take advantage of That old saying many expensive lessons? share many expensive lessons a large swork to the search mology between the mology of science in the fields of science and business is contained in the fields of science and business is contained in the fields of science and business is contained in the fields of science and business is contained in the fields of science and business is contained in the fields of science and business is contained in the fields of science and the scien McBOOKS & A single may be book to you. of these McGraw Hill Rooks that you would like dozen as many you or half a syou wish.

Read them for you as many as you wish. for ten days free keep those you want. Read them for want. was raw for the keep you want was raw for the those you these you don't want.

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Paid in full within six months.

There is no additional on the for books Purne prices are the hudget plan.

Same as for cash.

Richey-

Electric Railway Handbook

Second Editlon, 798 pages, flexible, pocket size, 528 illustrations, \$4.00

A thoroughly revised reference book of practical data, formulas and tables for the use of operators, engineers and students. It gives the essential reference data on all pbases of electric railway construction and operation. It presents: (1) Data on subjects which come up in everyday electric railway practice. (2) Material of service to the non-technical manager or operator. (3) Reference material on electric railway practice for those who are specializing in other or allied lines.

Harding-

Electric Railway Engineering Third Edition, 480 pages, 6x9, 248 Illustrations, \$5.00

A thorough revision of this standard work on the theory and practice of electric railway engineering. The book covers the principles of train operation, power generation and distribution, equipment and types of systems.

Kurtz-

Lineman's Handbook

550 pages, packet size, flexible, illustrated, \$4.00 The first book written expressly for linemen, foremen, and other employees of line departments. The book meets the growing need for a pocket volume of construction and maintenance data, procedure, and methods. It presents hundreds of kinks, shortcuts, expedients and time- and worksaving methods, as well as scores of useful diagrams, tables, and formulas for the lineman.

Standard Handbook for **Electrical Engineers**

Fifth Edition, 2,100 pages, 43/2x7, flexible, illustrated, \$6.00

A widely-known encyclopedla of electrical engineering. The book covers every branch of modern electrical engineering. It is complete and retiable, and so carefully and fully indexed that its information is readily accessible.

Croft-

American Electricians' Handbook

823 pages, pocket size, 900 lllustrations, flexible, \$4.00

The book is a reliable, useful handbook for wiremen, contractors, linemen, plant superintendents and construction engineers. It aims to give the practical man the facts on apparatus, materials and installation which he needs in his daily work. It is practical from cover to cover.

Choose the books you want to see - and just mail the coupon

Blake and Jackson-

Electric Railway Transportation Second Edition, 437 pages, 6x9, 121 illustrations, \$5.00

A second edition of this widely known book on whown book on the transportation side of the electric railway business — getting the cars over the tracks — increasing the trafic — collecting the fares — and selling service in the face of modern conditions. Particular consideration is given to the place of the bus in modern transportation.

King-Railway

Signaling 369 pages, 6x0, 349 illustrations, \$4.00

\$1.00

A completely adequate book on all phases of modern railway signaling. The book describes fully the construction, installation, operation and maintenance of signaling equipment, and presents a thorough discussion of principles.



Nash— Economics of Public Utilities

This book presents the essential facts and the most mature views upon the underlying financial and economic phases of public utility companies with particular emphasis on electric rallways, electric light and power companies and gas companies.

It discusses every angle of the public utility as a business and treats thoroughly such subjects as capitalization, investment features, franchises, regulation, valuation, depreciation, taxes, rates, service, accounting methods, public relations, etc.

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Send me the books checked for 10 c'sys' free examination:	
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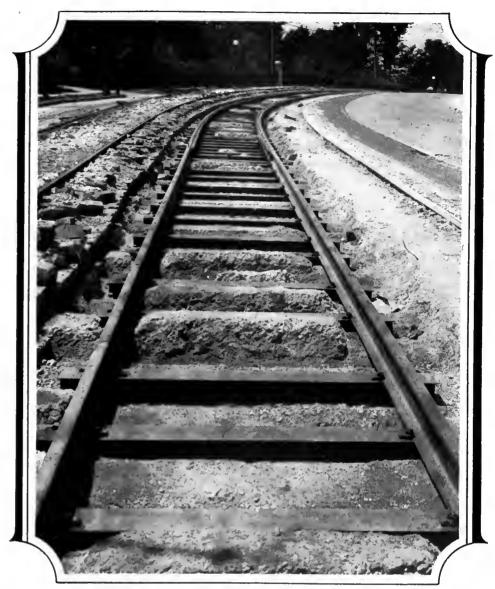
Croft's American Electri-cians Handbook, \$4.00. ...Biake and Jacksona' Elec-tric Railway Transporta-tion, \$5.00.

....King'a Railway Signaling, \$4.00.Nash's Economics of Pub-lic Utilities, \$4.00.

.... Standard Handbook for Nash's Economics of Pub Electrical Engineers, \$6.00. ... Nash's Economics of Pub Ite Utilities, \$4.00. I agree to return such books es I do not wish to keep, postpaid, or to remit for them within 10 days of receipt.

Name Home Address City

Position Name of Company.....E. 6-29



A
permanent
renewal
with

Carnegie Steel Cross Ties—

Track renewal with wood ties is only a temporary improvement. The use of steel ties however, means a permanent track foundation. Temperature variations, water and decay do not affect Carnegie Steel Ties. This is proved by the excellent condition of these ties uncovered for rail renewal after 18 years in heavy duty service.

The illustration shows an inexpensive renewal job. Wood ties set in concrete had been formerly used. After eleven years service, steel ties were substituted, using the old concrete base.

For real economy, renew your old track for the last time with Carnegie Steel Ties. They guarantee lower costs per mile per year.

Booklet-"Steel Cross Ties"-on Request

CARNEGIE STEEL COMPANY

CARNEGIE BUILDING — PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

HE TWO RADIATORS which cool the motors in the Twin Coach are products of the

LONG MANUFACTURING CO.
DETROIT MICHIGAN



IONG

AUTOMOTIVE RADIATORS



AUTOMOTIVE CLUTCHES

KEEPING IN STEP



with the aavance in motor coach designs





(Series)

Forerunner of today's modern coach was the rebuilt touring car and modified truck.

1922

Beginning of modern bus equipment.

1927

The bus of common usage.

1928-9

This year finds a vehicle adapted to carry heavy peak loads.

Presenting the first of a series of advertisements to show the progress this transportation system is making.



Great progressive steps have been made in bus development during recent years, and engineers are still striving for improvements by which transportation service may still be bettered.

As better busses are built they are added to Akron's system with the object of providing the best and most up-to-date equipment.

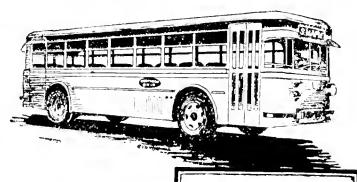
N.O.P. & L.Co.

Reproduced herewith is a series of Akron newspaper advertisements by Northern Ohio Power and Light Company. This is management enterprise-unexcelled.



United Electric Railway Bus Lines at Providence R.I. are now operating 55. 21 have been purchased this spring -

550 Juin Coaches Juin national nous in national nous pervice Constantly Increasing our supply of New Twin Coaches



This is the second of a series of advertisements to show the progress being made in your transportation system. The latest type of bus for enty service—is represented here. Twenty eight of these busses, seating 40 passengers, are operating in Akron. Eleven others are in interurban service. Plans provide for greatly increasing this type of equipment during 1020.

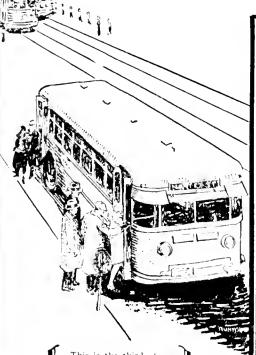
There will then be available for use in Akron city nearly 200 busses.

In no city in the United States has there been such bus development and extension in regular transportation service as in Akron. Such development is of value to Akron throughout the world.

N.O.P.&L.Co.

50 heavy carrying Twins are operating across the Campus Martius the hub of Detroit operated by Detroit Motor Bus Co. Eastern Michigan motor

Meeting the Rush Hour EMERGENCY



This is the third of a series of advertise ments to show the progress your transportation system is making.

DURING normal periods of the day in Akion from 65 to 75 busses could easily provide adequate service.

When peak loads come during the rush hours this number is in creased nearly threefold, requiring 160 to 175 busses! These busses are actually needed less than four hours a day but the investment must be made to provide for this emergency public demand.

An additional number -10% of the emergency requirement - must be owned to provide a repair reserve, that is the number undergoing repairs dealy.

The same proportionate requirements are necessary in street car service investment.

N.O.P.&L.Co.

Co. Cascern Michigan motor Buses and Detroil Street Railway

New 130
HORSEPOWER
Twin Coach
Motor's
Drive them

Boston Elevated is using Twins to sweep up heavy spots on it's routes. This one company operates 26 Twins. 4 more ordered

12 MOUTWIN COACHES

To Better Your Service

Within a short time these big, roomy 40-passenger busses will be operating in all parts of Akron.

With delivery of this order 34 will be in city service.

Your transportation Company readily goes to the full extent of its ability in supplying riders with modern equipment

Public ecoperation is aiding materially in the upbuilding of Akron's transportation system. Never before has the pull-together spirit been so dominant as today. Such spirit means we are going forward to a bigger and better city.

The Foundation has been laid - building may now go ahead with ease by continuation of this cooperation.

This is another in the series of informative advertisements concerning Akron's transportation development



N.O.P. & L.Co.

Watch

for Twins on Parlor Car Route this Summer

Twin Coach knows Timken Economies

Nothing else meets all traffic conditions so well as Timken dual load capacity.

Radial, thrust and resultant loads are carried. Friction is reduced to a negligible quantity. All the causes of premature wear and journal failure are removed. Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken electric steel permit the journal and the motor and the car to operate to full normal rating.

Notice the number of new types that come out Timken-equipped. Most makers, like the builders of Twin Coach, endeavor to help purchasers flatten power curves, avoid all possible maintenance and add years of extra life by equipping with Timken Bearings.

THE TIMKEN ROLLER BEARING COMPANY
C A N T O N, O H I O

TIMKEN
TOPETED
ROLLER BEARINGS



Announcing AnacondaWire & Cable Company

General Offices
25 BROADWAY, NEW YORK



Chicago Office
111 W. WASHINGTON STREET

Wire and Cable Mills-

GREAT FALLS, MONT. KENOSHA, WIS.

HASTINGS-ON-HUDSON, N. Y.

PAWTUCKET, R. I.

FORMERLY TUBULAR WOVEN FABRIC CO.

ANDERSON, IND.

FORMERLY THE MARING WIRE CO.

MUSKEGON, MICH.

SYCAMORE, ILL.

FORMERLY THE INLAND WIRE & CARLE CO.

Wire and Cable Products made by the Ansonia, Conn., Waterbury, Conn., and Detroit, Mich., mills of The American Brass Company, an affiliated company, will be sold exclusively by the Anaconda Wire and Cable Company.

ANACONDA WIRE AND CABLE PRODUCTS

Bare and Tinned Copper
Wire and Cable
Hollow Conductors†
Composite Cables
Hitenso "BB"* Wire & Cable
Signal Bronze Wire
Copper Trolley Wire
Hitenso* Trolley Wire
Seamless Cable Connectors†

Paper-lead Power Cable
V. C. Lead Sheathed Cable
V. C. Braid Covered Cable
Weatherproof Wire & Cable
Slow-burning Wire & Cable
Office and Annunciator Wire
Magnet Wire—Maring Process Magnet Wire
Antenna Wire & Cable

Durawire, * Rubber Covered
Wire & Flexible Cords
Duraflex, * Armored Cable &
Flexible Steel Conduit
Duracord, * Heavy Duty Portable Cord
Durax, * Non-metallic Sheathed Cable
Duraduct, * Non-metallic
Conduit

* Trade Mark Reg. U. S. Pat. Off. | Patented

2444 Cars per day use this silico-manganese weldable crossing

THE new Silico-Manganese Special Trackwork recently introduced by Bethlehem combines weldability with high resistance to shock and wear.

This trackwork is being used in many locations where service is unusually severe. An example is the installation of a Bethlehem Silico-Manganese Crossing at 12th and Market Streets, Phila-

delphia. An average of 2444 heavy double truck cars go over this crossing every day.

Bethlehem Weldable Special Trackwork — called design No. 999 — combines virtually all of the desirable features of the hest previously-used forms with the great advantage of being easily repaired by welding. It is recommended for your 1929 requirements.



12th and Murket Streets, one of the busiest intersections in Philadelphia. A Bethlehem Silico-Munganese Crossing is installed at this point.

> Below is the Bethlehem Silico-Manganese Crossing before installation at 12th and Market Streets, Philadelphia. Note the welded contruction.

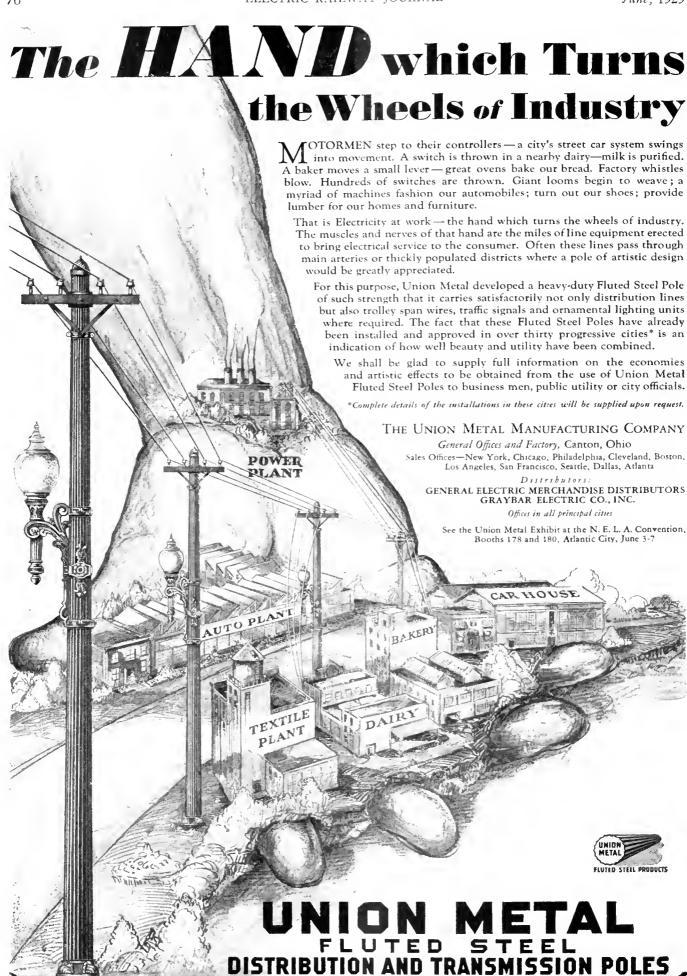
BETHLEHEM STEEL COMPANY General Offices: Bethlehem, Pa.

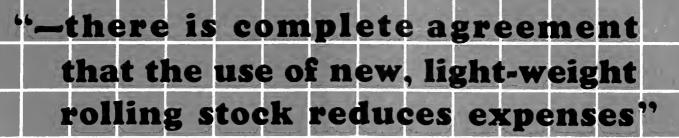
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, New York City, Sole Exporter of our Commercial Products

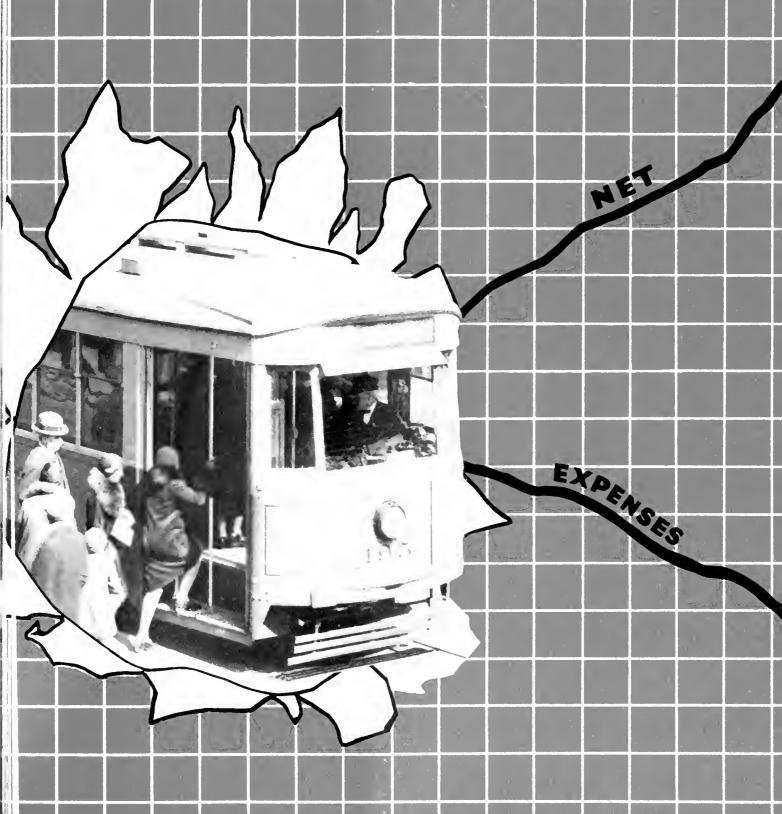


BETHLEHEM





-from an article by Morris Buck in May, Electric Railway Journal.



Carry Them-YES! But Carry Them AT A PROFIT



THE public expects to ride in comfort and enjoy extraordinary service at pre-war prices. In fact, the public demands it! But it costs money to carry people—often, it seems, more money than they will pay. What's the answer?

New cars-that's the answer.

Cincinnati Light-Weight Cars.

May we refer you back to the May issue of Electric Railway Journal, page 583, "New Car Survey Shows Increased Net on Many Properties"? This article aptly illustrates our contention that new cars have paid their way—have created profits where losses were customary. It's necessary to spend money to make money. It's the net profits you're interested in.

To carry the public at a profit new, modern, attractive, lightweight rolling stock is necessary. Cincinnati builds just this kind of equipment.



THE story is told of a man who paused to watch three stone masons at work. Being curious, he asked them what they were doing.

Said the first, "I am working for a dollar an hour,"

Said the second, "I am a stone cutter."

Said the third, "I, sir, am building a cathedral!"

Cincinnati, too, is <u>building</u>—Building for a greater tomorrow, not just grinding out products for today.

We take pride in building transportation units that make for more economical, more efficient, more appealing transportation. Whether it be street car, trackless trolley or gas-electric coach, Cincinnati is building for you—building the right kinds of units to fit modern transportation needs—building transportation that earns profits.

THE CINCINNATI CAR CORPORATION
Winton Place
Cincinnati, Ohio



that provides both method and equipment

use spray systems. This cooperation is of especial value to electric railway operators whose finish maintenance problems often demand individual consideration. Spray guns of various types

DeVilbiss has engineered some of the largest spray systems operating in the world today. Many, many times DeVilbiss engineers have rendered an installation service that was far more valuable than the cost of the equipment.

THIS organization renders a constant service to all classes applying paints and I finishes, helping the users determine the most economical and efficient ways to

The application of protective and decorative coatings reaches into an almost infinite number of activities and groups. Changing times and the modern popular preference for color have brought painting and finishing problems into occupations and industries that never before have been confronted by such necessities. Intensified competition has forced many painter contractors and maufacturers to seek quicker and more economical painting and finishing methods.

finishing and refinishing buses and cars are invited to consult members of our organization who specialize in such finishing operations.

Air compressing equipment. Electric railway operators who want to inaugurate this new and better method and equipment for Air transformers and accessories.

DeVilbiss Spray-PAINTING System

THE DEVILBISS COMPANY

272 PHILLIPS AVENUE TOLEDO, OHIO

NEW YORK

and sizes.

fixtures.

connections.

Pressure feed paint tanks

Spray booths, exhaust fans,

Air and fluid bose and

Complete outfits from the smallest hand-operated units to the largest industrial installations.

and approved lighting

and containers.

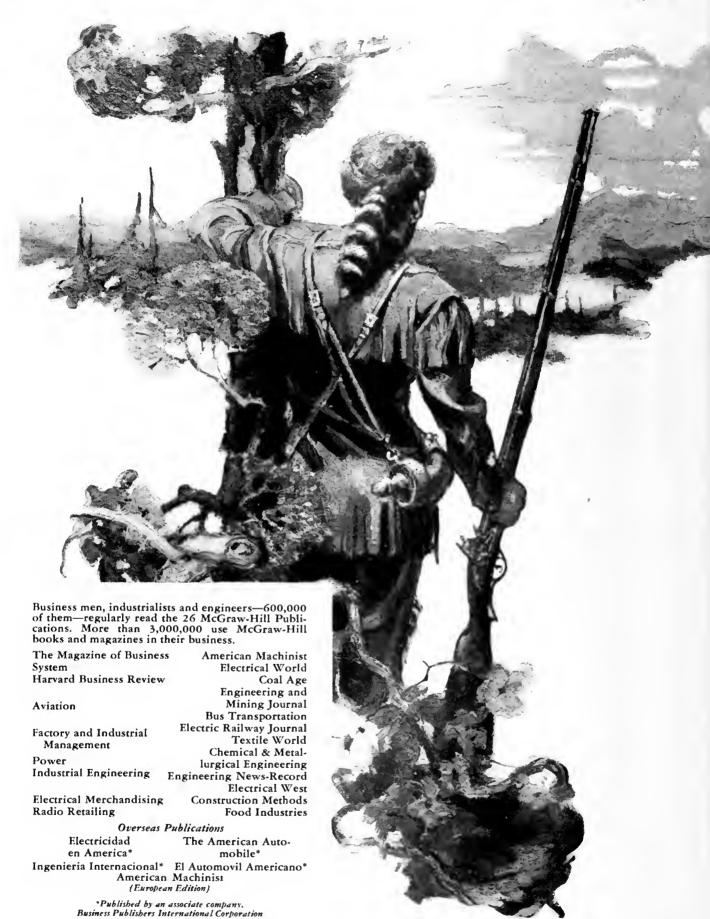
PHILADELPHIA ST. LOUIS Sales and Service Branches DETROIT CLEVELAND

INDIANAPOLIS

CHICAGO

WINDSOR, ONT. SAN FRANCISCO

Direct factory representatives in all other territories



McGRAW-HILL



There's ALWAYS a New FRONTIER

Daniel Boone blazed the trail. When Yadkin Valley ceased to be a frontier, he moved on from the Carolinas... to Kentucky, to the Kanawha, and finally to the region that is now Missouri... finding out what was there... battling with wilderness and Indians... conquering new conditions.

Boone typified the first phase of American pioneer life. But with its passing our frontiers did not pass—they only changed ... changed from unbroken plains to undiscovered markets... from tangled wilderness to unsolved industrial problems. Today's frontiers still have their new horizons of expanding opportunities, advancing standards. But in place of woodcraft the modern pioneer must have business vision . . . and the modern business paper is blazing his trail.

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Fuel and motor oil have such a marked influence upon the performance of each other that they should not be considered separate items in determining motor coach operating costs.

The fluid friction caused by too heavy a motor oil increases the consumption of gasoline, sometimes as much as 8%. A gasoline that does not ignite readily and burn completely produces excessive motor oil dilution—often to the point of decreasing lubricating quality 50%.

Red Crown Gasoline and Polarine Motor Oil form an ideal combination a gasoline that gives power, mileage and complete combustion—a motor oil that is not too heavy yet is rich and sturdy, supplying thorough, efficient lubrication to the motor. Red Crown and Polarine have been refined to work in harmony, to give, separately and together, maximum service in the internal combustion engine.

Have our engineers make a test of Red Crown and Polarine in your motor coaches. Compare the combined operating cost of this gasoline and motor oil with the combined operating cost of any other fuel and lubricant and let the figures speak for themselves.

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"More miles operated

More passengers carried

More earnings per mile"

- said the operator



– when Rubber substituted Rails

Various Comparisons Between Coach and Rail Operations

	Coach	Rail at time of discontinuance
Rate of Fare	8c.	7c.
Route Miles Operated	17	12
Cars or Coaches Operated	6	5
Routes Operated	4	3
Passengers Carried Annually	741,394	541,150
Earnings Per Mile20	.60 (Average)	18.60
Miles Operated Annually	314,212	188,499



HE Shawnee-Tecumseh Traction Company, of Shawnee, Okla., faced a grave problem in 1926. For years the business of the street railway had been falling off. Revenues had dropped steadily. Every cent of earnings went toward keeping the system running—and the earnings were constantly growing smaller.

Only by neglecting necessary maintenance were the street cars barely able to earn a gross of 18.60 per mile, which was quickly swallowed up by the most necessary out-of-pocket expense.

Had track, car and other maintenance been kept up the operating expense would have been around 24c. per car mile—and to have taken care of deferred maintenance covering all departments would have required

an expenditure of approximately \$150,000—an outlay out of the question in the face of dwindling revenue.

It was hard sledding to even meet expenses. Something had to be done.

On Sunday morning, January 9, 1927, six 21-passenger City Service Yellow Coaches took the place of the five street cars—a 100 per cent substitution of rubber for rail.

Immediately the riding public of Shawnee responded. Earnings per mile jumped to 20.60 and operating costs dropped to 17.54, with over 200,000 more riders annually for Yellow Coaches. In September, 1927, an additional Yellow Coach was added.

Yellow Coaches had saved the day, built public goodwill and cooperation, and changed a losing fight into a profitable operation.



What the Press Thought of the Change

"The street cars abdicate. The Coaches reign. A new transportation system comes to replace the old. Shawnee applauds the change, as any growing ambitious city approves changes that are tinged with modernity. Shawnee will boast of its new transportation system, and will point with pride to the big Yellow Coaches as evidence of the City's progress."

* * *

"Big Yellow Coaches Popular"

"The Yellow Coaches have been tried and found not wanting. The big coaches took up Sunday morning where the street cars left off Saturday night . . . The coaches have made a decided hit with the public. Superintendent Blackwell of the Traction Company, said: 'We believe the public is going to enjoy riding in the big Yellow Coaches'."

* * *

Thus it was that the evolution from a street car system, not earning its operating expenses, was eagerly welcomed by both press and public.

An Increase in Fare + More Miles Operated + More Passengers Carried + More Earnings Per Mile + Lower Operating Cost = A Satisfactory Net Profit

This Tells the Story

A S A RESULT of the change, the city approved an increase in the rate of fare from 7 to 8 cents.

Yellow Coaches now operate 314,212 miles annually as against 188,499 street car miles and carry approximately 750,000 annual passengers as against 550,000. Earnings have increased, operating costs have dropped. Instead of an annual loss, the company is now making an annual profit. The results achieved by Shawnee can be duplicated wherever a similar transportation problem exists. The type of service offered by Yellow Coaches *invites* patronage and goodwill and insures profitable operation.

SHAWNEE-TECUMSEH TRACTION COMPANY

Operating Costs

TRANSPORTATION 5.00 Gas and Oil 2.38 Garage Labor and Expense 1.59 Superintendence and Miscellaneous .74 MAINTENANCE TOTAL 9.71 Maintenance, Buildings and Equip 2.38 Depreciation 2.41 TOTAL 4.79 GENERAL AND MISCELLANEOUS 1.25 Insurance and Damages .85 1.25 Insurance and Damages .94 .94 .94 GRAND TOTAL 17.54 .754

NOTE: While the item of Insurance and Damages is here carried at .85 this company has operated more than a million miles in a period of two years and have never had a personal injury claim of any kind.

GENERAL MOTORS TRUCK COMPANY—PONTIAC, MICHIGAN

YELLOW COACHES

Half a Million Stops!

These Brake Blocks are Good for a Million More



Their use in the densest traffic conditions in the world proves the extraordinary lasting quality of Johns-Manville Moulded Asbestos Brake Blocks

HEAVY passenger busses operated through the most congested traffic districts of a large eastern city* average forty stops to the mile. Yet Johns-Manville Special Bus Blocks of Moulded Asbestos are making astounding performance records under these severe conditions. Here is a real test of braking material.

Johns-Manville Special Bus Blocks



The photograph above shows J-M Special Bus Blocks applied to Timken Axle Brake. Twelve thousand miles of service, approximately half a million stops, have worn down only 1/8" from the original 3/4" of block. These Blocks are undoubtedly good for a million stops more.

J-M Special Bus Blocks are furnished in practically any thickness from 3/8" up to 1" or more in any size and curvature. They are moulded to exact size and shape so that every application is really a "tailormade" job. These blocks will stand extremely high temperatures; will provide a constant and uniform co-efficient of friction throughout their life, and will rarely, if ever, score a brake drum of suitable composition. We have records of brake blocks that have given more than 40,000 miles of continuous service averaging 700 stops per day for 225 days.

The claims for Johns-Manville Bus Blocks, as for all J-M Brake Linings are based on performance. They are quiet in operation and positive in braking action. They have longer life than any other friction material. They keep costs down. We ask only that you try J-M Brake Blocks as a test. We will abide by the result.

* Name of city and operating company on request

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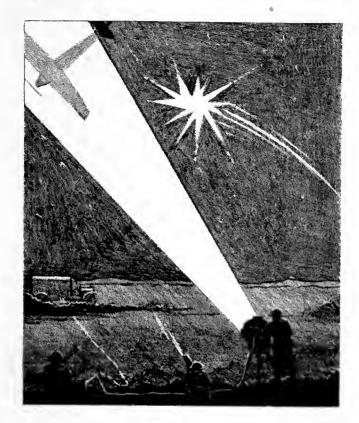
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will aid in reduction of power consumption

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Make a test of TULC

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The U. S. Army has purchased a Fraser Unit to be installed in a special army truck. In addition to deriving the benefits of the gaselectric drive, the Fraser Unit will act as a generating plant, furnishing current for portable machine shops, searchlights, radio, telephones, telegraphs, field hospitals, X-ray and photographic equipment and to all remote areas.

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In Altoona, Pennsylvania

The Fraser Gas-Electric Drive has been selected to meet the severest kind of operating conditions.

National Railway Appliance Co.

420 Lexington Ave., New York



Helpful Facts about electrical insulation





Goodrich Goodrich Silvertowns

Among the large users of Goodrich Heavy Duty Silvertown Truck Tires are: Marshall Field & Co. Chicago, Ill.; National Biscuit Company, New York, N. Y.: Indian Refining Company, Lawrenceville, Ill.; Illinois Brick Company, Chicago, Ill.; Gensumers Rock & Gravel Company, N. Hollywo d, Calif.; Wm. Wrigley Company, Chicago, Ill.; II. J. Heinz Company, Pittsburgh, Pa.

White built Stamina in these Buses Goodrich put Mileage into the Tires



RANK MARTZ, whose buses are a familiar scene on Wilkes-Barre, Pa., streets, also operates long-distance bus service to New York City, Philadelphia and Buffalo. His fleet has grown from one in 1908 to over one hundred today.

Significant is the fact that with twenty-one years of successful bus operating experiences to draw upon, the Frank Martz Coach Company has repeatedly specified Heavy Duty Silvertown Tires.

The full measure of comfort and dependability, with profit from long mileage added, is BUILT INTO EVERY
GOODRICH SILVERTOWN
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- Additional adhesion—from greater insulation between outside plies.
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- 4. Extra gum fillers between plies for longer tire life.
- 5. Heat-resisting, interlocking cord breakers.
- 6. Tread designed correctly for heavy duty service.
- 7. The whole tire toughened by the famous Goodrich "rater cure."



Fourteen new White model 54 Buses leaving Cleveland, Ohio, on Goodrich Heavy Duty Silvertown Tires to join the Frank Martz Coach Company's bus transportation fleet at Wilkes-Barre, Pa.

assured when Goodrich Heavy Duty Silvertowns are used on your buses. Remember them for *mileage*, comfort and dependability . . . Goodrich Silvertowns.

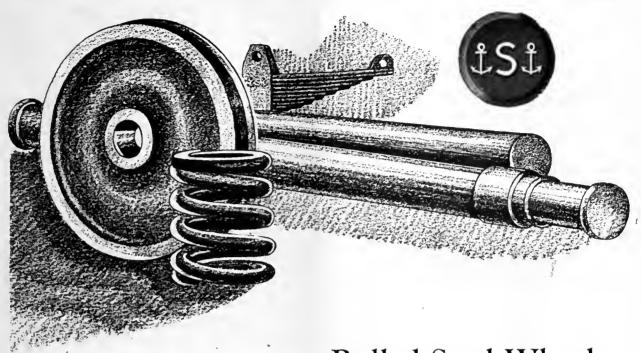
The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ontario.

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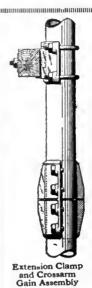
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C Type—for reinforcing pole corroded at ground-line. Or to extend pole with pipe of same size, as illustrated.

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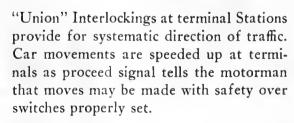
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he same care in selecting ole types, sizes, spacing,

and other line details is used in designng any important ectrical equipment.

Turn the page for a ruther complete discussion of pole strength anditsrelation to pole line design.

modern successful utility. The design of pole lines is one of the last strongholds of the

old system.

Why Poles Break

A pole is a cantilever beam. While it is subject to a variety of stresses failure is almost invariably caused by bending moments. A pole breaks, therefore, when the stress in the outer fibres resulting from the bending moments exceeds the natural resisting strength of the wood.

Where Poles Break

While a mathematical solution shows the critical section in a pole to be at the point where the diameter is one and one-half times the diameter at the point of load application, for practical designing purposes this point coincides with the ground line.

Calculating Load

The maximum load tending to break a pole is that produced by a transverse wind when pole and wires are covered by sleet. The bending moment at the ground line is the sum of two quantities—(I) the moment calculated as the wind pressure times the projected area of the pole, times the distance of the center of gravity of the exposed section of the pole above the ground and—(2) the wind pressure times the projected area of the wires (with sleet, if any) in the adjacent span times the distance of the wires above the ground.

The Resistance to Breaking

The moment of resistance of a pole opposes the bending moments calculated as shown above. This moment of

resistance is calculated as the ultimate fibre stress in pounds per square inch, times the cube of the ground line diameter in inches divided by 122. Whether a pole breaks, therefore, depends on whether the moment of resistance is greater or less than the moment of bending.

The bending moment is multiplied by the factor of safety required on the line. From the resulting moment of resistance is computed the ground line diameter by reversing the process referred to above, using in this calculation the fibre stress of the species of wood selected. Ordinarily the strongest wood is the most economical.

Ultimate Fibre Stress Critical Factor

It is obvious, therefore, that one of the critical factors in designing an economical pole line is the selection of the pole with the highest ultimate stress. The remainder of the design, of course, requires good judgment and careful calculations but it is all subject to ordinary engineering design procedure.

How Do We Know the Ultimate Fibre Stress?

The ultimate fibre stress of a given pole can only be determined by claborate testing methods far beyond the possibilities of the ordinary buyer. Since wood is a product of Nature and not subject to scientific control, its physical properties are not absolutely uniform. The test of a single pole would not be conclusive, therefore. The only practicable way to determine ultimate fibre stress in species of wood available for poles is to rely on records of extensive tests undertaken by government and other disinterested agencies.

Southern Pine Association tests show a modulus of rupture of that wood of 7500 to 8800 lbs. per square inch green and 13,900 to 18,300 lbs. per square inch air dry. The same wood is shown lly Forest Products Laboratory tests to have a modulus of rupture 7600 to 8700 lbs. per square inch green, and 13,000 to 15,500 lbs. per square inch air dry. These figures are all based on averages of many tests. There is no other wood commercially available for pole use with a strength approaching these figures. For purposes of comparison, the fact may be mentioned that the Forest Products Laboratory figures for western red cedar are 5200 lbs. per square inch green, and 8800 lbs. per square inch green, and 8800 lbs. per square inch air dry.

Conservative designers take these and similar figures to indicate that if 7200 lbs. per square inch is used for southern yellow pine, the comparable figure for cedar should not exceed 5000 lbs. and if 6800 lbs. per square inch is taken for pine as is frequently done, the comparable figure for cedar should not be more than 4300 lbs.

Moment of Resistance Tabulated

For convenience in comparing designs, the following tables showing moment of resistance to bending have been computed for both pine and cedar on the basis of the modulus of rupture indicated above.

CREOSOTED YELLOW PINE POLES—CLASS SIZES IN GENERAL USE

Using a Modulus of Rupture of 6,800 Pounds

WESTERN RED CEDAR POLES—CLASS SIZES IN GENERAL USE

Based on Modulus of Rupture of 4,300 Pounds per Square Inch*

	Class A		Class ti		Ctass C		Ciass D		per Square Inch							
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20	30	30,563	28	24,849	26	19.895	24	15,648	22			43,760	35,316	29,750	23,285	17,831
25	34	44,491	31	33,723	28	24.849	26	19.895	25	67,455	53,452	48,444	39,387	33,390	26,386	20,437
30	37	57,338	34	44,491	30	30,563	28	24.849	333	76,927	67.455	58,793	48,444	39,387	33,390	26,386
35	40	72,447	36	52,814	32	37,092	30	30,563	35	90,883	76.927	67,455	58,793	48,444	39,387	33,390
40	43	90.001	38	62,114	34	44,491	32	37.092	40	102,391	90,883	76.927	67,455	58,793	48,444	39,387
45	45	103,152	40	72,447	36	52.814		•	45	114,831	102.391	90,883	76,927	67,455	58,793	
50	47	117,526	42	83,866	38	62,114	****	********	50	128,240	114.831	102,391	90,883	76,927	67,455	*******
55	49	133,177	44	96,427			*	**********	55	142,654	128.240	114.831	102.391	90,883	· ·	
60	52	159,166	46	110,183			****	*******	60	163,500	142,654	128,240	114,831	102,391	**********	*********
65	54	178,247	48	125,188		*********			65	180,401	163,500	142,654	128,240	102,371	**********	•
70	55	188,334	50	141.498	**		****	***********	70	198,428	180,401	163,500	142,654	**********	• ••••••	
75	56	198,795	52	159,166	****	**********	*							**********	**********	
80	57	209,636	54	178,247	****	****	****	**** *** ***	75	217,618	198,428	180,401	163,500	**********	*******	**
85	59	232,486	56		****	****	****	*********	80	238.007	217,618	198,428	*********	******	********	***********
90				198,795	****	*********	****	*********	85	259,631	238,007	217,618	*** ********		***********	*****
	61	256,940	58	220,864	****	***********	****	********	90	282,528	259,631	238,007	***************************************	*****	**********	********
*Results of some strength tests on wooden poles, April 6, 1923, Forest Products Laboratory, U. S. Department of Agriculture, Madison, Wisconsin																

For additional copies of this series of studies of pole line design or for quotations and infurmation on AMCRECO Creasoted Southern Yellow Pine Poles, address the nearest sales office.

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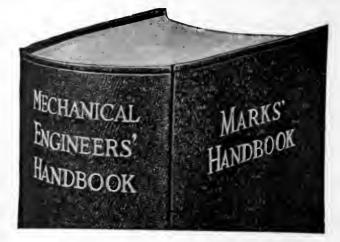
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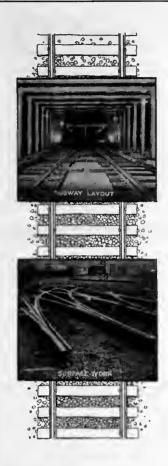
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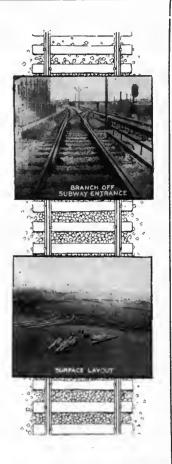
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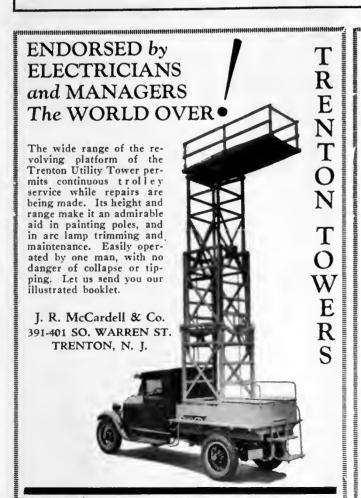
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and
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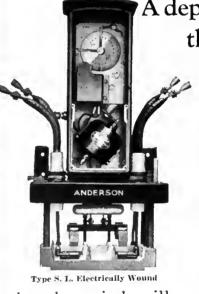


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July Issue Closes JUNE 15th

Early receipt of copy and plates will enable us to serve you best—to furnish proofs in ample time so changes or corrections may be made if desired.

ELECTRIC RAILWAY JOURNAL.

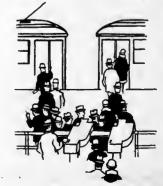
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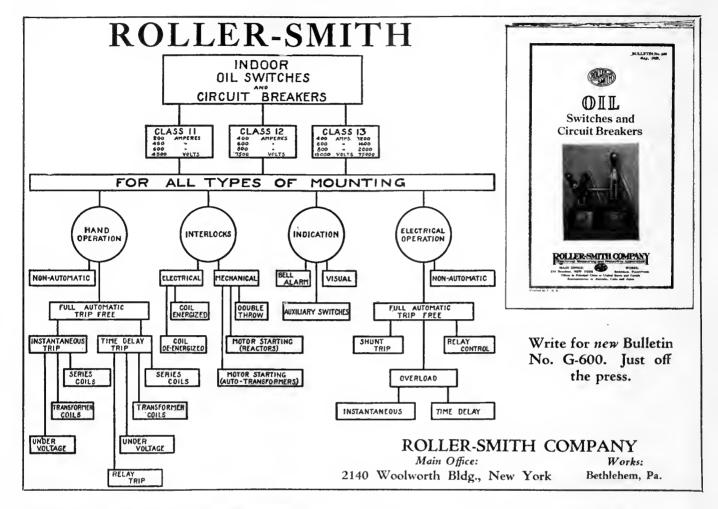
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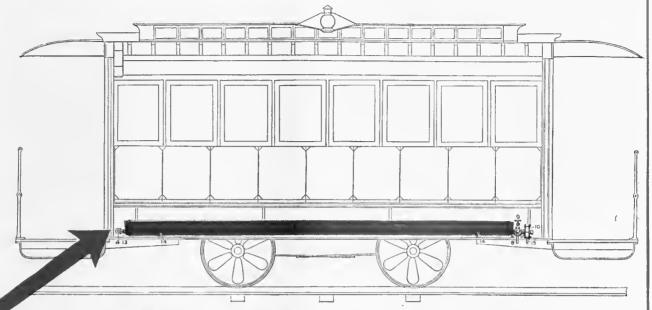
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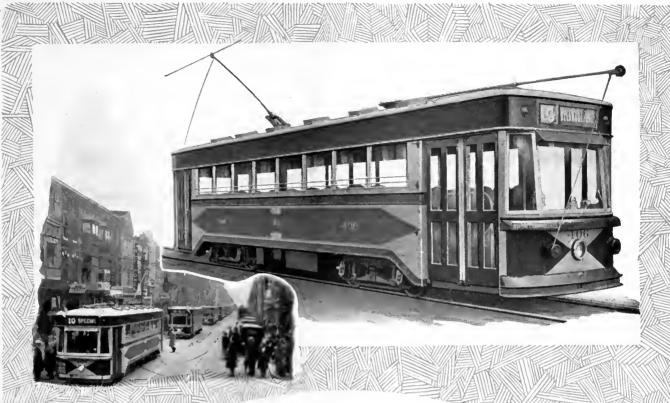
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W. 62nd and Denison, Cleveland, Ohio

BENDER BODIES





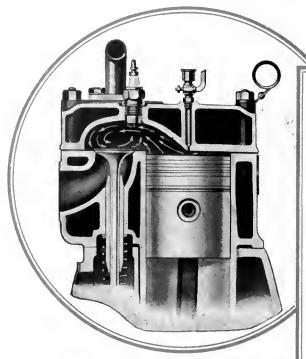
Wilmington Orders Ten More!

Last year the Delaware Electric Power Company purchased ten Brill low-level city cars for service in Wilmington, Delaware, one of which was exhibited at the 1928 A.E.R.A. Convention in Cleveland. This operating company had faith in the revenue-producing qualities of up-to-date equipment—cars of proven performance plus rider appeal. Proof that this faith was justified is now apparent because ten additional cars, practically identical with the first lot of ten, have been ordered.

This repeat order is a fair indication of the value of modern cars in meeting competition. In business building qualities as well as performance, we believe that Brill cars are unequalled. Judge for yourself.



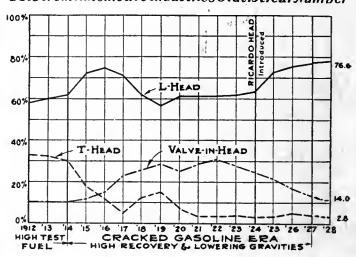
BIRILL MODERN CAIRS



Cross-sectional view of a Ricardo Head Engine indicating how complete combustion is promoted by turbuience, as shown by arrows.

Trend in Valve Location

Data from Automotive Industries Statistical Number



Simplicity wins

The L-Head engine—with its direct, well lubricated valve gear—has always had the call over other engine types on account of its great simplicity.



A glance at the chart will show that not even DURING THE WAR did the overhead valve seriously challenge the L-Head. In 1924 the RICARDO HEAD principle was introduced. Its advantages were promptly recognized and in its basic principle it was widely adopted. L-Head engines have rapidly increased in popularity ever since—while the use of overhead valve engines has shown a correspondingly marked decrease.

Waukesha L-Head Engines, with Genuine Ricardo combustion chambers combine high power, reliability, efficiency and long life with simplicity. Write Automotive Equipment Division for descriptive bulletin.

935

WAUKESHA MOTOR COMPANY

New York Office: 8 West 40th St.

WAUKESHA, WISCONSIN

San Francisco: 7 Front Street

ELECTRIC RAILWAY JOURNAL

cGraw-Hill Publishing Company, Inc.

IULY, 1929

Thirty-five Cents Per Cop

On the one hundred and fifty-third anniversary of our country, we pause to consider its remarkable growth. Electric Railway Service has been an indispensable factor. Advertising, too, has contributed much. For decades these two have been closely associated through Collier Service.

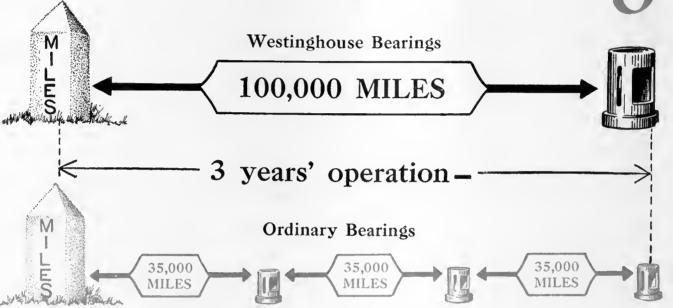
Car Card Advertising Almost Everywhere

JULY 4"

Barron G. Collier, Inc.

NEW YORK CITY

-Bearing Miles Miles of Bearings



- are your bearing replacements in the



Red

or

Black?

YOUR ultimate armature bearing cost involves more than the original price of the part. Labor required to replace a bearing constitutes a large percentage of the total.



WESTINGHOUSE ELECTRIC & MFG. COMPANY
EAST PITTSBURGH PENNSYLVANIA
SALES OFFICES IN ALL PRINCIPAL CITIES OF
THE UNITED STATES AND FOREIGN COUNTRIES



Electric Railway Journal

JOHN A. MILLER, JR. Acting Macaging Editor Morris Buck Engineering Editor GRORGE J. MACMORRAY CLIFFORD A. FAUST J. W. MCCLOY

Vol. 73, No. 16

CHARLES GORDON, Editor

PAUL WOOTON Washington ALEE MCCALLUM London, England

LOUIS F. STOLL Publishing Director

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JULY, 1929

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An analysis of the relation between the length of traffic signal cycles and the efficiency of street use.

JAMES H. MoGRAW, Chairman of the Board MALCOLM MUIR, President JAMES H. McGRAW, Jr., Vice-President and Treasurer EDWARD J. MEHREN, Vice-President MASON BRITTON, Vice-President EDGAR KOBAK, Vice-President HABOLD W. McGRAW, Vice-President C. H. THOMPSON, Secretary

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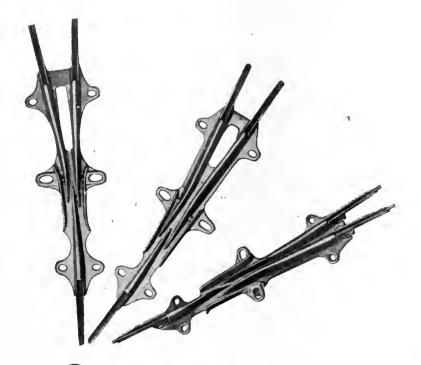
Publishers of Electrical World . American Machinist Bus Transportation Power Coal Age



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Radio Retailing 1929 Avi Electrical Merchandising Engiocering and Mining Journal Chemical and Metallurgical Engineering Subscription Prices: United States and its possessions, Canada, Merico and other countries taking domestic poetage rates, \$3 a year. All other foreign courtes, \$5 a year. Published monthly. Single copies, \$5 cents. Sold in combination with ELECTRIC RAIL-WAY JOURNAL NEWS (published on 39 Saturdays during the year) for \$4 domestic and \$8 foreign. The separate subscription price of ELECTRIC RAIL-WAY JOURNAL NEWS is \$2 a year domestic and \$4 a year foreign. Entered as second class matter June 23, 1908, at the Post Office, New York, N. Y., under the cot of March 3, 1879. Printed in U.S.A.—Conyright, 1929, by the McGraw-Hill Publishing Company, Inc. Official correspondent in the United States for Union Internationale de Tranways, de Chemins de fer d'intrêt local et de Transports Publics Automobiles.

Member A.B.P. Member A.B.C. Number of Copies Printed, 6,289



OVERLAPPING RUNNERS An eminent feature

An eminent feature of Westinghouse trolley frogs

THE long service obtained from Westinghouse trolley frogs results from a design in which the wheel travels smoothly through the frog. Overlapping the runners prevents the wheel flange from touching the pan. Properly curved runners keep the wheel riding true. Long bayonet approaches, easily removable, lead the wheel onto the frog without bumping or arcing.

The type LW frog has been designed

for use with narrow, small diameter trolley wheels.

The type CG frog has been designed for use with large trolley wheels having a width exceeding 1½ inches.

The type UF frog is a universal 10 degree frog for railway application. Different sizes of wheels can be operated successfully where this frog is used.

All frogs are made of malleable iron, galvanized, and equipped with bronze bayonet approaches.

WESTINGHOUSE ELECTRIC & MFG. COMPANY EAST PITTSBURGH PENNSYLVANIA SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES









Maple Substation, Pittsburgh Railways Co.



Switchboard for Maple Substation

Two years—and a Third

FEW months hence, and the Pittsburgh Street Railways Company will have a third Westinghouse automatic railway substation added to their ever-expanding system.

Two years ago this company specified Westinghouse automatic substation equipment for its Dormont and Maple stations. As a result of their successful operation, similar equipment has been specified for the Griffith substation which is now being constructed.

This new substation will be a complete Westinghouse installation, including such equipment as: one-1000 kv-a. outdoor type OISC transformer arranged for either 11 kv. or 22 kv. operation on the incoming side; one-1000 kw. synchronous converter; and a complete automatic switchboard.



The advantages derived from the installation of automatic railway substations are discussed in Circular 1793. Request your copy from our nearest office.



WESTINGHOUSE ELECTRIC WESTINGHOUSE ELECTRIC STATE EAST PITTSBURGH PENNSYLVANIA SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES

WESTINGHOUSE ELECTRIC STATE OF THE SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES

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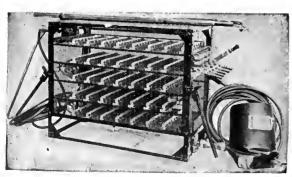
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Take it from Mr. Kettering:

66A black bank balance is popular applause for your existence. A red balance is the hiss of the community.

This Vice-President of General Motors knows transportation. He knows what the transportable public likes—and so do you.

You know that you may earn applause and not get it. You know also that unless you earn it you can't get it.

The only way to earn it is to provide comfortably swift, safe, silent street car rides.

The only way to do that is on smooth track.

Weld and grind

—and oil the curves

Raflway Trackwork Co.

3132-48 East Thompson Street, Philadelphia

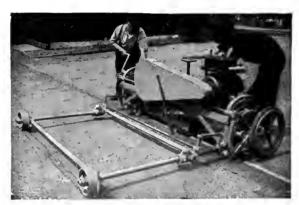
AGENTS

Chester F. Gailor, 50 Church St., New York
Chas. N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London
F. F. Bodler, San Francisco, Cal.

G 2798



Reciprocating Track Grinder



Vulcan Rail Grinder

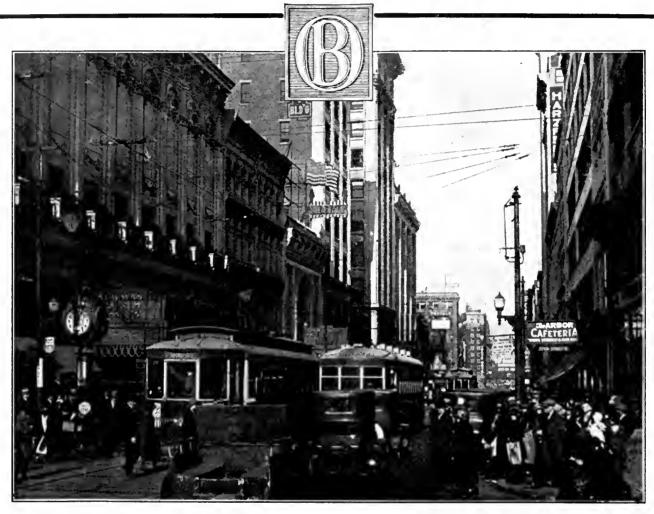


Midget Rail Grinder



RTW Curve Oiler

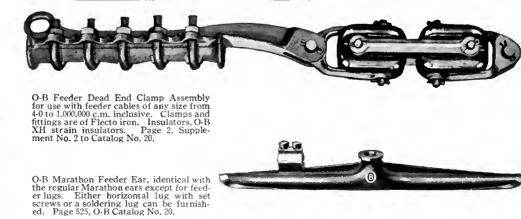
Strength and Much Plus O-B



In Kansas City, Missouri, the use of O-B feeder wire materials by the Kansas City Public Service Company helps maintain an efficient feeder system of attractive appearance. A few of the O-B feeder wire materials are listed below.



O-B Porcelain Insulator No. 9953, one of a number of such insulators designed for feeder wire service. Pages 20 to 27, O-B Catalog No. 20.



DOLLAR AND

VESTMENTS

Better Appearance Quality

SENSE ONG ago the need for greater utility and better appearance in feeder wire systems became apparent. With this viewpoint, the selection of materials for feeder wires became a subject

for investigation and study. As a consequence, this important factor in the operation of electric railway properties has reached a higher degree of efficiency, and has, in practically every locality, ceased to be an eye sore. In fact, the appearance is generally far superior to other types of pole line construction.

Feeder wire materials manufactured by O-B have done their part in this improvement program. Obviously, materials bearing the O-B trade-mark, and designed for feeder system use, must be of a quality commensurate with that expected by the industry of trolley materials. Therefore, the same standards of excellence in design and manufacture which have always applied to O-B trolley materials are to be found in O-B feeder wire materials.

The use of wet ware electric porcelain, of Dirigo composition insulation, of O-B Bronze and Flecto Iron provide ample strength to insure effic-

ient, continuous service.

Engineering study, by O-B Engineers and in conjunction with engineers of electric railway properties the country over, has developed materials designed to add greatly to the neat appearance of the feeder wire system, as well as the trolley system, and to provide for efficient connection with the trolley wire.

And on many properties these quality O-B materials are adding longer life, strength, greater reliability and improved appearance to the overhead. Complete information covering O-B feeder wire materials can be obtained from your O-B representative, or of the

> Ohio Brass Company, Mansfield, Ohio Canadian Ohio Brass Co., Limited Niagara Falls, Canada 1095L









O-B Feeder Wire Splicer for stranded copper wire, from 40 to 1,000,000 c.m. Arrangement of set screws provides perfect splice electrically and mechanically. Page 552 O-B Catalog No. 20.



O-B Span Feeder Insulator for supporting and insulating feeder wires at span wires. Bronze casting attaches around split porcelain spool and clamps tightly

FLOODLIGHTING



...for publicity

...for increased business

... for efficiency and safety

GOLDEN GLOW FLOODLIGHTS

and their famous mirror glass reflectors, that all Electric Railway men know, will transform amusement parks, points of historic interest, statues, etc., into things of greater beauty at night. Crowds will go miles to see them and they'll go on your cars.

Golden Glow Floodlighting will also increase night business in your outdoor parking places; it will lower the accident rate in your terminal yards and speed-up inspection and repair work; it also furnishes practical illumination for track repairs at night.

Floodlight your administrative buildings, too, for low cost publicity and safety.

1929 is the Golden Jubilee of Light! Make light work effectively for your profit!

Write for Bulletins Nos. 173 and 174.





Type L 1419—Golden Glow Lantern Floodlight with glass panels removed to show method of mounting reflector and lamp within the lantern.

Golden Glow Projector of all aluminum construction incorporate meay novel features of efficiency and economy in operation and installation



ELECTRIC SERVICE SUPPLIES Co.

MANUFACTURER OF RAILWAY, POWER

Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, 1il. and 50 Church Street, New York City.



Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg.. Detroit; 316 N. Washington Ave., Scranton. Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.

Cach Quin Times. Iwin



BEING IMPRESSIONS OF TWIN COACHES WRITTEN BY OTHERS

\$250,000 Bus Fleet for Key Tunnel Line

(From Key System Commuter)

Purchase of \$250,000 worth of bus equipment to be used on the Oakland-Alameda line through the Estuary Tube has been announced by the Key System Transit Company. According to A. J. Lundberg, president of the transit company, the new buses are of the most modern type of equipment and are known as the "street car" type. The buses seat 40 persons and are the product of the Twin Six Coach plant in Kent, Ohio. The new buses, 20 in number, will be delivered in two lots.

"We are endeavoring to give Alameda the very latest type of bus equipment," President Lundberg says. "Our engineers have combed the markets and have made a complete survey of the many kinds of equipment available today. Our Vice-President, Il. P. Bell, in charge of engineering, has just returned from the East and the purchase of this new equipment is the result of his studies. The buses are known as the street car type and resemble in general appearance and appointments a modern street car. Each bus is equipped with two complete power plants—two motors mounted in the center of the car. This center mounting of the motors effects a perfect balance and makes for easy riding."

Bulletin

June business flashes:

Pattern Twin Coach shipped to London, marking advent of manufacturing overseas.

First of new 21-passenger Twins hauling 40 ready for July 1.

Detroit Motorbus Company adds 10 more jobs; 78 special charter trips in one day recently.

Twins sweep onward into Dixie with orders from Jacksonville, Savannah, Chattanooga, Nashville and New Orleans.

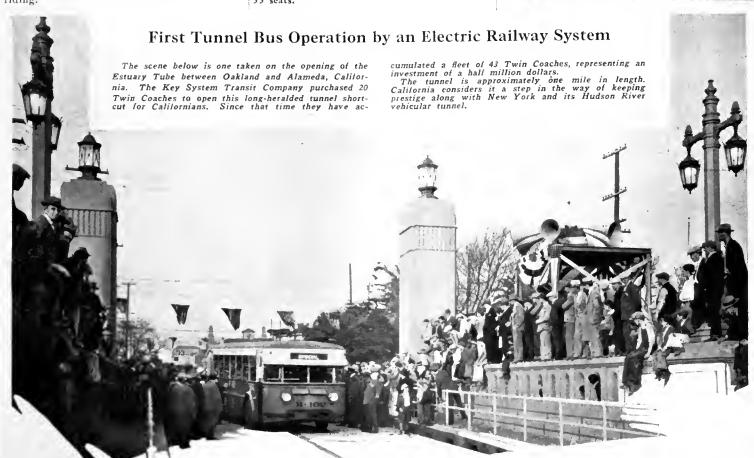
Steam railroads increasing use of Twin equipment. Orders from Southern Pacific and Union Pacific for parlor car Twins.

Northern Ohio Power & Light Company fleet of Twins now totals 82; United Electric Rwy., 55; Key System, 43.

Milwaukee Electric Railway and Light Company submits fifth repeat order; Boston sends sixth repeat order.

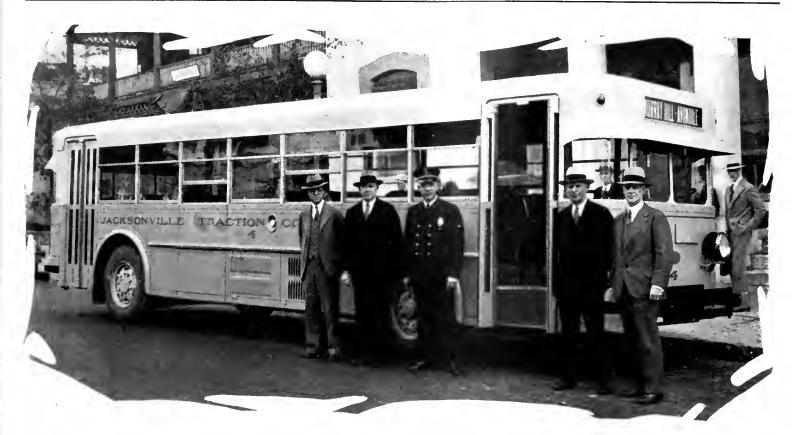
Twin Coach Corporation sales for the first six months of 1929 surpass same period last year when shipments placed it second in total coaches sold to electric railway industry and first in number of coaches sold of capacity greater than 33 seats.







TREND ТО WITH RIDER THEIR



"Smooth as Velvet"—Declares Jacksonville Traffic Director

(From Florida Times Union)

City officials went bus riding today-and liked it. It was one of the Jacksonville Traction Company's new twin coach, 40-passenger, blue and cream buses.

"The new buses are all right," Mayor John T. Aslop, Jr., decided.

"Smooth as velvet," said Police Chief A. J. Roberts, as he glided over the city.

"More comfortable and speedy than I anticipated," remarked Alex Ray, city treas-

"They'll greatly reduce traffic congestion in the downtown district," remarked Lieut. Francis Smith, head of the police traffic

While trying out one of the buses, John P. Ingle, manager of the street car company, instructed that it be stopped at the city hall so the city officials could see it.

A few minutes later the mayor and other city executives went for a ride through the business and residential sections on the bus.

Above is one of the four new buses just purchased for express service between the business district, Avondale and Murray Hill.

In the picture, left to right, are: E. T. Hollingsworth, Jr., secretary of Mayor John T. Aslop, Jr.; John P. Ingle, manager of the street car company; Lieut. Fraueis Smith, head of the police traffic bureau; Police Chief A. J. Roberts.

SEE OUR NEW MOTOR BUSES

The newest addition to our transportation equipment is a wonderful product in motor cuach construction. Four Twin Coaches have been bought. They will be on display again today and tomorrow in the business and residential districts, at convenient locations, for your inspection.

We believe you will appreciate the lines along which they are built. We want you to inspect the coaches—the general specifications—note the smart finish, both interior and exterior-the front and rear doors-the richly upholstered scats and generally efficient equipment—all the last word in motor coach transportation.

These buses will begin operating on an express schedule between Murray Hill, Avondale and the downtown business district Monday.

Jacksonville is one of the first cities in the Southeast to obtain some of these buses.



Jacksonville Traction Company

Not a Jolt in Carload Claims Wabash Patron

(From Terre Haute Tribune)

It was the inaugural tour of the new Twin Coach for the Wabash Valley Coach Company, which just arrived Saturday, and s-a-y, Boy! -riding in that luxurious coach is just like "going to heaven in a hanging basket."

Anyway, this bus is the last "squeak" in comfortable travel. It sounds hardly dignified to "dub" this coach a bus, because it is the aristocracy of busdom. It seats forty, and there ain't no crowdin'. You just sit back resting against these squashy cushions, which fit into your back like a specially con structed pillow. No matter how many railroad crossings you go over or how much rough pavement there is to travel, you just rock away 'nd enjoy yerself.

This ceach is the first unit in the fleet which will save the time of the busy man who can save four hours from Indianapolis to Louisville, Ky., via Terre Haute and to Vincennes, then over the Studebaker line to the city of the Kentucky derby.



win Cach Juin Gimes. Twin Cach



WARNING! PLACED ON ONE ROUTE - THE OTHERS WANT THEM TOO

'Street Cars on Rubber at Last" Comment of Norfolk Bus Riders

(From Norfolk Ledger Dispatch)

Norfolk's new "street cars on rubber" have more than lived up to expectations since their introduction to local bus passengers. Expressions from a score of local business men, bus drivers, passengers and traffic officers make the new system an overwhelming

To get first-hand conditions the writer took a 45-minute ride on one of the Gargantuan Utopians of Comfort via the Colonial Place line and learned a few of science's tricks to expedite elastic traffic in Norfolk's fast-growing city and suburbs. A head-on view of some prehistoric reptile emerging from a thousand-year slumber. It is radically dif-ferent from any other bus design. You look for the customary radiator and it isn't there. You look for a fender and you have to look, again, for there isn't any. From the driver's seat one might think he were coming to earth after a dirigible ride, and to use the expression of one driver, "I look for the engine and it ain't there, but she goes jus' the same."

One driver said, "I can make any turn with this that I could with the other bus. And I've never yet had to pass up a passenger; there is always room for one more."
From six o'clock in the morning until three in the afternoon he had taken on a total of 890 passengers.

For riding comfort the writer has seen little to compare with them. The luxurious inter-

city coaches as used between New York City and outlying suburbs, boasting air seats and wicker chairs, have little to add to the riding comforts of Norfolk's newest transportation

Inside the bus is a palace of luxury, so far as suburban buses go. Brown leather seats, dome lights and an aisle that would do justice to the length of an entrance to a bank president's office in Wall Street feature the most composite requisites of these Twin Coaches.

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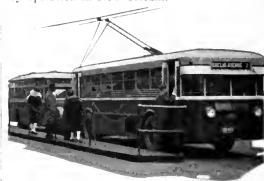
Just why anybody would ride in a bus or a stage when they could ride in a street car or on a train has always been a mystery to us, but men like Fageol are making marvelous strides in the development of highway transportation and unless the old time rail systems soon have something better to offer they are going to wake up some fine morning and find they are out of business.

> Van Nuys Tribune, Van Nuys, Calif.

? ? ? ? ? ?

New Orleans Buys Twin Trackless Trolley Unit

The New Orleans Public Service, Inc., has placed an order for one 42-passenger Track-less Trolley, equipped with 50 horsepower motors. This unit will be used in making studies of the possibilities of Trackless Trolley operation in New Orleans.



The advent of the 21-passenger Twin Coach will make possible its adaptation for Trackless Trolley operation. This will be the first development of the smaller capacity trackless unit so much discussed and looked for by many small city properties.

When Detroit Fired Jitneys Off the Street

(From Correspondence)

This is what Del Smith, making an unusual record as Manager of the Detroit Street Railways, wrote:

ways, wrote:

"To say that we are pleased with this equipment is putting it nildly, but what I say of the bus also holds true for the organization that is responsible for its design and manufacture. The promptness with which you were able to make delivery of the fifteen buses recently furnished was sincerely appreciated, and was just another example of the resourcefulness and dependability of the Twin Coach Corporation. Twin Ceach Corporation.

"Our Twins are doing a splendid business on the Cadillac Coach Line, which now gives a direct service downtown from the East Harper and East Warren sections. The uniquo design and wonderful riding qualities of the Twin have drawn many favorable comments from our patrons, and one has only to see the bus in actual service to get an idea of its splendid riding appeal to the traveling publication.

Del A. Smith, General Manager.

Department of Street Railways, Detroit.



Detroit operations now include 78 Twin Coaches.



Cach Quin Cimes. Win



EARLY NEWS HAULING COMING: PASSENGER

Women Insist Upon Twin Coaches

Oberlin College Girls' Glee Club Makes Spring Trip of 700 Miles by Twin Parlor Coach

(From F. B. Miller, Manager, Cleveland-Akron-Canton Bus Company)

"It may interest you to know that we have just completed arrangements for transporting the Girls' Glee Club of Oberlin College from Oberlin, Ohio, to Ithaca, New York. These young ladies, with their chaperones, were very definite in specifying that our special party

trip should be via Twin Coach.

"I am enclosing a photograph taken of the Glee Club en route, which I think indicates better than words may do the great comfort and convenience which they enjoyed on this trip, showing that they knew full well the merits of the Twin for long distance travel.

"In arranging special party trips for women, I found that once they have learned the capabilities of the Twin Coach in climinating the usual inconvenience and discomfort caused women through improper chassis balance and by escaping gasoline odors, they invariably specify a Twin Coach for their

"This is an entirely new experience in my career as an operator of special charter service for women.



41-Passenger Coaches Replace 25-Seaters; Revenue Jumps 15%

(From Electric Railway Journal for June)

(From Electric Railway Journal for June)

O. A. Smith, Traffic Manager, Pacific Electric Railway, states that they recently replaced some of the older 25-passenger buses with 41-passenger Twin Coaches on a crosstown line. Operating costs, including taxes and interest, were reduced from 25-26c per bus mile to 20-21c per bus mile, headway was increased from 8 to 10 minutes, with patronage increased more than 15% as a result of the new equipment. Average speed for the line is 11.2 m. p. h. and average revenue per passenger is 545c.

minutes, with partonage ment. Average speed for the line is 11.2 m. p. h. and average revenue per per is 5½c.

"The private automobile is our chief competitor," says Mr. Smith, "and it he-hooves railway operating men to study the situation to provide more comfortable seats and equipment. Sales methods must be applied and the product must be of such a quality that it will compete with the market."

Below is a photograph of the streets of Los Angeles showing something of the competition which Manager Smith comments upon.

The Los Angeles Motor Coach Company, an affiliation of the Pacific Electric, is operating 14 Twin Coaches.



HOUR THE HOUR

A Limited Trips every day from downtown Buffalo to the heart of Rochester

EVERY Blue Bus out of Buffalo is now on a limited schedule—four-teen limited trips each day between Buffalo and Rochester— eary how on the hour. Those who have waited for express trips can for-get old schedules, knowing every hour is a time-saving through trip over the short Bergen route. Direct, express lines service from down-town Buffalo to the heart of Rochester in two hours and fifty-five minutes,

The trip is so pleasant thousands of motorists leave their cars at home and ride the Blue Bus because they enjoy the comfortable, carefree ride at less cost than driving their own cars.

Ride the Blue Bus and save taxi fares. Business men and salesmen prefer its restfulness and convenience, the saving of time-raking transfers.

Women and children enjoy the beau-tiful country acenery, the clean, fresh air Blue Bus operators are always careful, courteous and considerate.

To accommodate the constantly in-creasing crowds who ride the Blue Bus (already enjoyed by over 4,000 in a sin-gle day), several new type twin-motor-ed coaches with clear-vision observation added to the Blue Bus safery freet, each seating 40 passengers and carrying baggage racks inside the coach.

Air-cushioned arm chairs, air shock-absorbers, air-brakes, balloon tires— smooth concrete highways all the waye— insure absolute comfort for you, also safety and reliability.

Ride the BLUE BUS

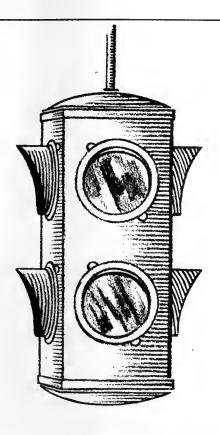


TERMINAL Clinton and Ethicott. Or board of one point tables and Further Info



HOUR ON THE

STUDY THIS: If there were a Coffin prize for transportation advertising, this specimen should win. Carefully prepared with time schedule and routes emphasized. Originated by L. H. Schultz and C. O. Frey of Western New York Motor Lines, Inc., at Batavia, N. Y.



Don't Blame the Traffic Signals for all your Traffic Delays

In heavy traffic the unloading and loading of singleentrance one-man cars delays the movement of pedestrians and vehicles more than any other single factor. The loading time far exceeds the running time.

Treadle-ization so decreases loading time that all street traffic is speeded. The decrease in running time improves your schedules and brings more passengers to your road.



NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works: Rahway, New Jersey

CHICAGO 518 McCormick Building MANUFACTURED IN TORONTO, CANADA, BY Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building

San Francisco is **Buying Comfort**

When George M. Pullman first operated his luxurious cars on the Michigan Central Railroad, the passenger traffic men of 1865 thought he was crazy to invest money in equipment which would increase the cost of travel.

When the Baltimore & Ohio Railroad installed Hale and Kilburn luxurious chairs in its day coaches, the passenger traffic men of 1926 were skeptical about investing money to make passengers comfortable. Traffic increases on the B & O have proved the wisdom of the investment. Now the Market Street Railway in San Francisco has equipped its street cars with Hale and Kilburn soft leather Walkover seats and is actively advertising the Comfort Feature. Traffic is increasing because of this policy.

The American public will always spend money for comfort and wise street railway managements can positively attract business by providing comfort in their cars.

Hale and Kilburn seats are the most important factor in making passengers comfortable.

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HALE & KILBURN COMPANY

General Office and Works: 1800 Lehigh Avenue, Philadelphia

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Kilburn Co., McCormick Bldg., Chicago

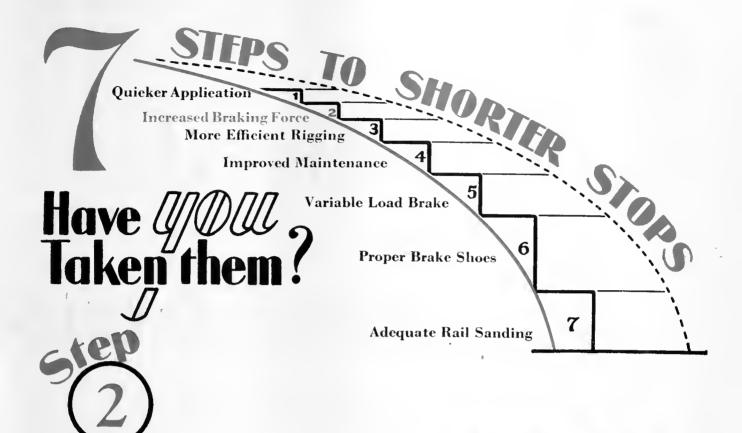
Kilburn Co., McCormick Bldg., San Francisco

Kilburn Co., McCormick Bldg

This Hale & Kilburn No. 392-A deep cushioned leather covered reversible seat is the one used by the Market Street Railway.

We are putting omfort into Street Cars





A VERY important factor influencing length of car stop is the relation of calculated shoe pressure to car weight—commonly called braking ratio.

A braking ratio of 2% per pound cylinder pressure (with maximum governor setting held to 60 pounds) is needed to provide a comfortably fast rate of retardation for modern street ears. This is important for quickly controlling speed in congested traffic as well as for making short stops from higher speeds.

Do you know how quickly your ears can stop? How quickly they should stop? A stop meter will tell you the first—our engineers can tell you the second . . . Ask them!

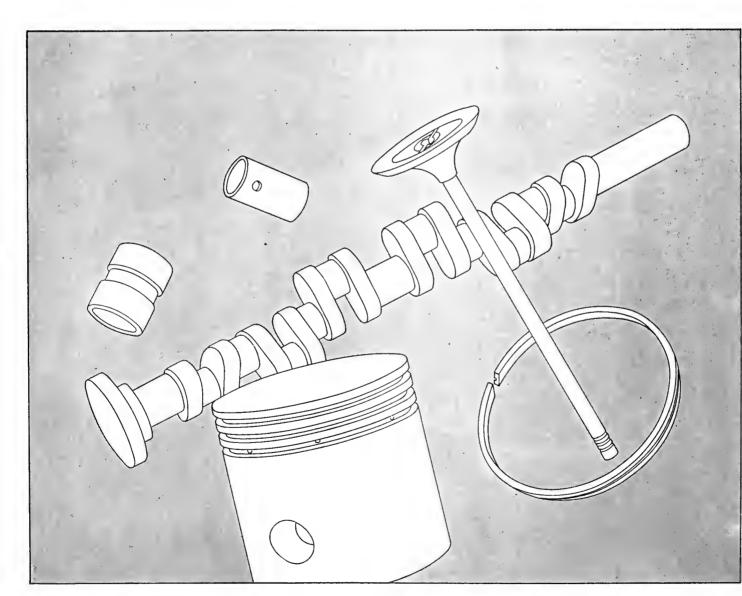


The brake cylinder is the business end of your brake system and should be large enough to develop sufficient shoe pressure with a leverage ratio low enough to assure proper shoe clearance.

WESTINGHOUSE TRACTION BRAKE CO. General Office and Works, WILMERDING, PA.

WESTINGHOUSE TRACTION BRAKES

Decreased Expenditures





Cities Service Company understands the problems of bus owners because it has had bus problems of its own. Several of its subsidiaries are transportation companies, operating fleets of buses. Cities Service brought its 67 years of experience in the oil business to the solution of their lubrication problems-and it offers you the benefit of this experience.

Decreased Expenditures for Replacement Parts \$658.82

That was the average amount per bus spent for replacement parts in 1928— 27% of the \$80,000,000 which was expended for bus supplies.

\$658.82 per bus. Every dollar cut from that cost is a dollar added to profits and proper lubrication will help do the cutting.

Koolmotor products Bus Lubrication Service is scientifically planned for the efficient lubrication of each individual part, taking all factors into consideration.

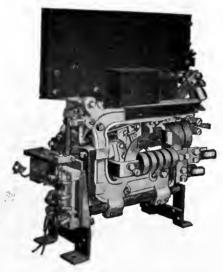
Koolmotor Bus Oils are refined from 100% Pennsylvania crude to meet the special requirements of heavy duty, high speed motor bus lubrication.

OIL DIVISION CITIES SERVICE COMPANY 60 WALL STREET, NEW YORK, N. Y.

KOOLMOTOR PRODUCTS

Equipment for

Protect your substations



Type JR 600-volt High-speed Circuit Breaker

WHEN an overload or short circuit occurs on the line, the converters or motor-generator sets in your substations will be safe from flash over if the protective breakers interrupt the circuit in less time than that required for a commutator bar to move from one brush to the next.

The G-E Type JR circuit breaker does interrupt the circuit in less than the required time. With its extremely high opening speed and its powerful magnetic blowout and narrow slots in the arc chute, it is giving remarkable protection to substation equipment and feeders.

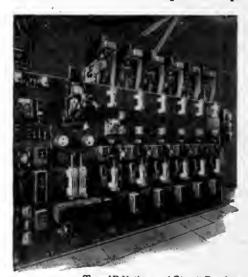
The G-E monogram on these high-speed breakers is your guarantee that they are mechanically and electrically right.

Detroit sends back five buses

A short while ago, the Detroit Street Railways returned five mechanical buses to be equipped with electric drive. This Company's experience with both mechanical and gas-electric buses has shown that electric drive makes good buses better.

Passengers like gas-electrics because they are smoother and quieter and because the driver has more time for little courtesies. The drivers like gas-electrics because they are easier to handle and do not require a great expenditure of physical energy. The maintenance men like them, too, because the electric drive minimizes the number of pull-ins and makes the bus available for more revenue miles per year.

The bus operator who has not taken advantage of electric drive is burdening himself with needless worry and expense.



Type JR High-speed Circuit Breakers in Ashmont Automatic Substation, Boston Elevated Railway

GENERAL ELECTRIC COMPANY

RASCHENECTADY, N.

Better Service

A new controller —the PCM— for a fast, smooth start

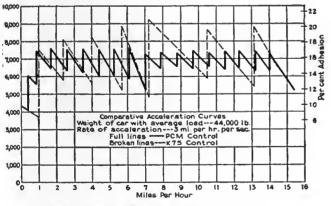
The usual acceleration of cars equipped with PCM control is 3 mi. per hr. per sec.; yet it is so smooth that passengers experience no discomfort.

The PCM control is automatic—it is impossible to slide over points. Its 18 points give an unusually small current variation, and hence a smoothness impossible with an ordinary controller at such a high rate of acceleration.

The Chicago Surface Lines, operating, as it does, under extremely difficult conditions, has specified PCM control on its 100 new cars.

In Milwaukee

In December, 1928, the Milwaukee Electric Railway and Light Company placed



These curves show why the PCM control gives such fast, smooth, acceleration



in service 10 cars with GE-265 motors and Type K control. Now, GE-265 and GE-301 50-hp., low-wheel motors and Type K control have been specified for its 40 new and rehabilitated cars.

More GE-265 motors have been sold to street railways than any other modern motor.

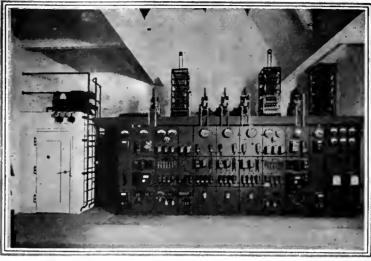


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330-130

ELES CTRES CITES





The main switchboard of the Inglewood substation of the Los Angeles Railway Corp., equipped with two 500-kw. mercury-arc rectifiers

The substation building

Why Los Angeles Selected GE Rectifiers

500-kw., 600-volt mercury-arcrectifier unit

The Los Angeles Railway Corporation selected two 500-kilowatt G-E mercury-arc rectifiers for its new station at Inglewood because—

- 1. A rectifier is the most efficient application of converting equipment for the existing operating conditions—low load factor with heavy momentary overloads.
- 2. It has an unusually high all-day efficiency, resulting in substantial economies in power.
- 3. Its quiet operation, which is obtained without noise-proof construction, is in keeping with the surrounding residential district.
- 4. It can deliver full power to the line in six seconds.
- 5. Economies in maintenance are demonstrated by units now in service.

These advantages are not peculiar to Los Angeles. You, too, can increase the efficiency of your substations, especially if the load factor is low, by installing G-E mercury-arc rectifiers.



G-E automatic substations have been reducing operating charges for the Los Angeles Railway for many years, but this, its first mercury-arc-rectifier installation, is its most efficient and economical unit.

130-1

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

MOGRAW-HILL PUBLISHING COMPANY, INC JAMBS H. MOGRAW, Chairman of the Board MALCOLM MUIR, President H. C. PARMELEN, Editorial Director

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Volume 73

New York, July, 1929

Number 16

An Outstanding Contribution Toward Orderly Civic Development

WITH the presentation of the final report of the Regional Plan of New York and Its Environs a long forward step has been taken in American civic progress. This is the first time in history that so comprehensive a plan has been prepared to guide the future development of a large urban and suburban district. All previous city planning projects fade into insignificance beside the remarkable undertaking just completed. When Major L'Enfant prepared a plan more than 100 years ago for the future development of the city of Washington, he was thinking of a Capital District of 100 square miles, which he believed might some day have as many as 500,000 inhabitants. The area covered by the Regional Plan of New York embraces more than 5,500 square miles with an estimated population of 20,000,000 by 1965.

The significance of the Reginal Plan, however, lies not in size alone, but rather in its broad conception of all phases of civic development. The provision of adequate public transportation facilities occupies a prominent place. In the past, surprisingly little consideration has been given to transit facilities by city planners. Highways, parks, playgrounds, water supply, etc., have been recognized as important factors, but transportation needs usually have been overlooked. This mistake has not been repeated by the Regional Plan of New York. In fact, the entire plan is built upon a network of rapid transit lines, electrified railroads and high-speed motor highways.

highways.

The projects outlined in the report are so colossal that their full magnitude is difficult to grasp. Tremendous obstacles lie in the path of some of these proposals. For example, it is planned to connect railroads entering the district, and operate through service over electrified distributing loops. The railroads which have already been electrified, however, have adopted different systems and installed them on hundreds of miles of track. To standardize their equipment for joint operation over common track would involve so many difficulties that the practicability of this feature of the plan seems extremely doubtful. Nothing could illustrate better than this the need for community planning. Had the Regional Plan of New York been adopted 25 years ago, the present confusion of systems probably would not have occurred.

With certain details of the proposed plan not everyone will agree. Modifications of various features probably will be found necessary in the future. The important point, however, is that a comprehensive program has been prepared for the development of the entire metropolitan area comprising many political subdivisions, but closely related socially and economically. Its execution will require the outlay of enormous sums, but by considering the problem in its entirety, it is estimated that

the cost will be considerably less than that of meeting one by one the needs of this growing region. Other communities might well follow the lead of New York in this endeavor to approach the problem of regional planning on a broad and comprehensive basis.

Car Survey Provides Striking Evidence

SO many advantages may be found in the replacement of old cars with new ones that it seems remarkable that car purchases have not been more widespread. Wherever new cars of the modern, lightweight type have been substituted for old, heavy, slow, dilapidated rolling stock, the resulting economy, improvement of public relations, and effect upon earnings have in practically every instance more than justified the investment. The survey of new car experience, of which the third and concluding article is published in this issue, summarizes these results for many properties representing a wide range of local conditions.

Far too much emphasis has been placed on the savings possible with modern equipment, and too little attention has been given to the possibilities for providing an improved service to meet the competition of other forms of transportation. The new cars that have been built are in general equipped with greater motor capacity in proportion to their weight than those they replace, and should be able to make considerably higher schedule speeds than the average maintained by most properties. Yet few companies show any material increase in speed with their new equipment. In many instances the new cars are placed on the same lines with old ones that cannot maintain the pace. Where full advantage has been taken of the possibilities of the new equipment, better service and reduced labor cost have been added to the savings made in power and maintenance.

Perhaps the most surprising result of the survey is that, even with the limitations that have surrounded the use of new equipment purchased during the past several years, the results on most of these properties have been uniformly favorable. It is no mere chance that those companies which have been most prominently identified during recent years as purchasers of new cars have shown better results, both in revenue and in expenses, than comparable properties that are clinging to obsolete equipment. Nor can the financial improvement be laid to the size of the cities in which these railways operate, for the gains are well distributed among small, medium, and large properties. When it is shown on the basis of these returns that a new car will save \$1,268 in power and equipment maintenance alone, disregarding for the moment track and transportation savings, and greater attractiveness and earning power, it is apparent that the investment in new cars is not only justified, but is demanded as a matter of sound business policy.

A Worthy Rival of the Automobile

LAST year the Pittsburgh Railways received from the Osgood-Bradley Car Company two experimental cars that were designed to appeal to the riders through better performance and greater attractiveness. Graceful lines and proportions, high acceleration and braking rates, smooth and quiet operation, comfortable seats. ample aisle room for rush-hour travel, low step heights and economical operation were the major objectives sought in these cars. The new cars were frankly experimental. They included practically every innovation in car design tried up to that time, with the possible exception of the substitution of aluminum in the body framing. The purpose was to study in actual operation those factors that were likely to appeal to the passengers and to determine the practicability of many equipment features proposed for the improvement of car performance.

Now, after a year's trial of the two cars the railway has secured a third experimental car. It differs from the two previous cars principally in that aluminum was used in place of steel for the car body framing and was substituted wherever possible in the various equipment items. It is also equipped with the latest development of worm-drive trucks and high-speed, spring-suspended motors. The floor plan was changed a little and a center exit door was used instead of a rear door exit. It is worthy of particular note that this third car is again equipped with electro-pneumatic control and dynamic brakes. The designers went further this time by providing foot operation of the control and dynamic brakes, a feature that is expected to prove helpful in one-man operation.

In the attempt to insure maximum operating speed, this unit seems to go the limit with four 50-hp. motors on a car which only weighs 27,000 lb. Aluminum was used to such an extent that the car body with its equipment is reported to weigh only 14,000 lb. The use of four 50-hp. motors on so light a car makes it a worthy rival of the automobile. With its pedal-operated control and brakes it is capable of getting away to a fast start in traffic, with brakes designed for quick and smooth retardation.

The question of first cost still remains as an important consideration in the design. The many automatic devices incorporated, and the aluminum construction must justify themselves economically before the trend of future cars can be predicted. To this fact the Pittsburgh management is keenly alert, and it is rendering a distinct contribution to the industry in its pioneering effort to work out in the laboratory of experience the type of equipment best adapted to meet the competition of the automobile.

Far West Leads in Pick-up and Delivery

EVER since the advent of the motor truck the electric railways engaged in freight service have been struggling with the pick-up and delivery problem. Most executives have leaned toward the opinion that this service is a natural corollary of the business, but they have hesitated to embark upon the enterprise for fear that the shippers would not support the necessary extra charges. Others have maintained that this is a service outside of their province; that the larger shippers do not expect it and would not pay for it, and that where pick-up

and delivery are desired the function should be left to independent truckers.

Last year a committee of the Central Electric Railway Association went on record in favor of the establishment of pick-up and delivery throughout the territory served by the Central Electric properties. While some progress has been made, the suggestion has not been generally adopted as yet. Apparently, individual roads hesitate to adopt this innovation until a general program for all of the carriers in the territory is worked out and agreed upon. Taking the industry as a whole, comparatively little has been done in the way of providing pick-up and delivery, although the subject has been under active discussion for several years.

In contrast to the general situation, the Pacific Electric Railway, of Los Angeles, Cal., recently instituted extensive store-door collection and delivery service as part of its freight business. This was undertaken for the dual purpose of meeting competition and supplying better service to the shipper. The necessary arrangements were effected by the company through contracts with reliable truckmen in the various communities along its lines. The better class of truck operators have been quick to see the advantage of an arrangement which promised to broaden considerably their sources of revenue. So satisfactory has the arrangement proved that the privilege of becoming allied with the railway in this progressive enterprise is eagerly sought. Thus have the two agencies of transportation been drawn together in mutually satisfactory co-operation.

All doubt as to the reception that the new service would meet at the hands of the shippers and the public, was soon dissipated. The original list of 24 stations has been expanded to 44, with further expansion in prospect. It is also significant that some 200 industries not previously served by the Pacific Electric Railway have become shippers over the line due to the increased convenience of the new service. Announcement of its expansion to meet growing requirements indicates that this commendable initiative on the part of the Pacific Electric Railway is meeting with the measure of success which it deserves.

A New Outlook in Toledo

OLEDO has written into its history for the past I two years some very interesting chapters. At the beginning of 1928 the transit situation in that community was a rather delicate one. The railway and the city had taken issue on a number of questions and it seemed as though events were leading from bad to worse. But this condition was suddenly reversed with the signing of an agreement which proved to be the turning point in the affairs of the Community Traction Company. Under the terms of this agreement, a supplemental ordinance to the Milner franchise of 1920, the city agreed to prohibit all competing transportation lines within a quarter mile of any of the company's street car or bus lines, giving the railway a virtual monopoly of all transportation service in the city. In return the company agreed to pay for a traffic survey, to set up a five-year reconstruction program amounting to \$560,000, to purchase new buses, to set up a replacement fund of \$230,-000 and to re-route its existing lines and expand its service into new areas.

Further, the company agreed to advance \$900,000 without interest for ten years to cover the accrued debts in the stabilizing fund. It invested in a number of new

buses, abandoned superfluous routes, established new routes in districts previously unserved, increased the motor capacity on a number of its cars, re-spaced car stops to reduce the running time, re-scheduled its service for higher speeds, instituted a safety drive and in several other ways attempted to give better service to more people. None of these moves were particularly spectacular, but each contributed to the betterment of the whole system.

Results have been most encouraging. Up to the first part of 1928 the riding had been steadily falling off and earnings had been constantly decreasing. Soon after the improvements outlined had been well started, however, more people began to patronize the system. In the succeeding months a number of records were established, consistently showing more passengers than in the corresponding months of the previous years. Operating expenses were also reduced by substituting buses on unprofitable lines and effecting numerous economy measures, so that net earnings show large increases for the periods. Increases in riding are expected to continue. The company is not stopping with the improvements it has already made; in fact, it is only beginning its track rehabilitation and equipment replacement programs. In view of the results accomplished in so short a period, the outlook in Toledo is bright indeed.

San Francisco Needs a Transit Policy

SAN FRANCISCO is squirming under the lash of the whip laid upon it by its own city engineer, M. M. O'Shaughnessy, in his report on the street railway requirements of the city with special consideration to the unification of existing facilities. Mr. O'Shaughnessy does not mince his words. He never has. He stands high in his profession, and San Francisco has confidence in him that almost amounts to veneration.

Mr. O'Shaughnessy has laid down many fundamentals for which electric railways have long been contending. He is for improved routing. He is against parking. He is against the jitney. He is against the imposition on the railway of paving requirements except those incidental to making track repairs, and any additional cost of street paving occasioned by the presence of tracks. He is for the skip stop.

Moreover, he declares that it is axiomatic that, from the standpoint of the riding public, the best service can be provided by a unified street railway system with universal transfers. He says without equivocation that a continuation of the operation on the 5-cent fare under private ownership means that both the quality of the service and the condition of the property will become poorer and poorer year by year. If Mr. O'Shaughnessy had set about writing the terms of Magna Charter for the electric railways, he could hardly have done better.

The report reviews the entire situation courageously and is fundamentally sound in demanding that the city adopt a policy and do something about it. The seriousness of the situation is reflected in comment by the *Chronicle* stressing the fact that the city does not yet know what it is going to do when the franchises of the private companies expire. That is both lamentable and inexcusable. The same commentator adds that Mr. O'Shaughnessy's report furnishes a mass of information useful in helping the city make up its mind. Certainly that is true. As the report says, the city should either carry out the charter mandate by taking over and operat-

ing the systems of the private companies, or adopt a plan whereby the private organizations can continue to render service of a character necessary for the progress and development of the community. In the light of that statement it is no wonder San Francisco squirms under the lash Mr. OShaughnessy has laid upon it.

Subsidy by General Taxation Is Unsound

IN THE REPORT on San Francisco's transportation problems by M. M. O'Shaughnessy, city engineer, he assumes that the city stands committed to the policy of municipal ownership and operation of its street railways and thereupon develops a proposal for the retention of a 5-cent fare, frankly recognizing the deficits that will accrue thereunder, and proposing to make up the deficiency from general tax funds.

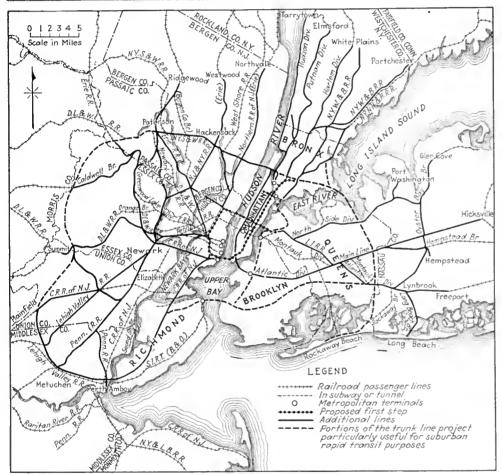
There ELECTRIC RAILWAY JOURNAL differs with the report radically and emphatically. It is bad enough for San Francisco to stand committed to a policy of public ownership. The answer to that is to reverse the policy before the city gets further into that bottomless cesspool of constant financial and political turmoil. But above all things, it is a fundamental mistake to put an operating management—whoever it might be—into dilemma of attempting to provide efficient transportation service that will keep pace with the city's growing requirements, handicapped with a 5-cent fare accompanied by a deficit to be made up from general taxation. That just can't be done, and it is flying in the face of public psychology to attempt it. Under such a plan, the whole weight of public opinion presses toward keeping the deficit and the tax rate at a minimum, with the inevitable result that service will seek the level of bare necessity with the maximum crowding and inconvenience that the public will tolerate.

Mr. O'Shaughnessy justifies this recommendation on the ground that a portion of the burden of maintaining a high grade transportation service should fall on the taxpayers whose properties and business are directly benefited, as well as on the rider who uses the service. The JOURNAL has little quarrel with that reasoning. In fact, the proposal to put a readiness-to-serve charge upon the benefited property is merely another step toward establishing an equitable distribution of the costs of transportation service between car riders and property owners that is so strongly advocated and clearly explained by the city's engineer in discussing the unfairness of present paving charges borne by the railways. But the report proposes that all property and business carry the burden of the operating deficit instead of the property specially henefited by the location of street railway lines. Rather than permit the deficit to recur year after year to plague the operating management, it should be wiped out through proper distribution of capital charges. The only available method of accomplishing the result sought would be to distribute a portion of the capital cost of the system as a benefit assessment against the property affected, in proportion to the benefits received, thereby wiping out a substantial portion of the fixed charges. This would represent application to a street railway system of the plan suggested for rapid transit in several cities. It would with one stroke distribute the costs of transportation service equitably and at the same time avoid that bothersome deficit that would be a constant bone of contention and a continual obstacle to good service—just as it has proved to be in New York.

BRONG LEGEND STATISTICS WILLIAM OF THE STATISTICS AND THE STATISTICS SINCE PROPER TO LEGEND AND THE STATISTICS Proposed First Step 0 1 2 3 4 5 Scale Miles

Transportation

Future requirements of this Metropolitan District analyzed in reports made by the Regional Plan of New York and Its Environs. Separate rapid transit system for commuters and co-ordination of trunk line railroad terminal operations proposed. Highways, parkways, bridges, tunnels and airports also included in comprehensive recommendations.



Interstate loop rapid transit system with extensions to the north and east is proposed as a first step in the solution of the commuter problem of the New York metropolitan district. The ultimate plan includes the utilization of a considerable mileage of trunk line railroads as well as the construction of numerous additions and connections, as shown on the lower map

ITH the object of securing better distribution of population, providing improved means of transportation, reducing congestion, and generally making the metropolitan district a more desirable place in which to live, an elaborate report has been prepared by the Regional Plan of New York and Its Environs. The proposed plan is the result of seven years work, carried out by engineers, economists and other experts at an expense of more than \$1,000,000. It covers not only New York City but all of Long Island, and territory in the states of New York, Connecticut and New Jersey lying within 40 to 50 miles of

the New York City Hall and dependent upon the metropolis for shopping, working and recreation. This area includes 421 separate communities and contains 5,528 square miles.

Over this vast region, which is so closely bound together by common interests that it must be treated as a unit, the new plan spreads a network of many miles of highways, parkways, trunk line extensions, and rapid transit lines, tving them together with new bridges and tunnels wherever necessary and interspersing them with new parks, playgrounds and aviation fields. These enterprises, it is proposed, shall be scheduled for completion prior to 1965. They are part of a program under which it is expected that 20,000,000 people will be able to live more comfortably in the region than 10,000,000 do at the present time.

The general appearance of the plan, as laid down on the map, is of a series of concentric circles, barred like a gridiron, but with the grids large enough so as not to impose a close rectangular system of layout. These

represent the highways, parkways, railways and rapid transit systems. They are laid out with the idea of enabling residents to go from one outlying section to another without passing through the congested portions of the city, as well as to give easy access to the central sections.

The plan assumes that Manhattan will remain the population center of the region, but that it will be closely rivaled by the western tip of Long Island and the communities on the west bank of the Hudson River. It is expected that New Jersey will grow with great rapidity when its transportation facilities are developed

Facilities Planned

for 20,000,000 People

and its waste lands, prominent among which are the Hackensack Meadows, are reclaimed.

Studies show that about two-thirds of the railroad passengers brought into the city are commuters. The remaining third, numbering at the present time nearly 100,000,000 annually, will have increased to about 270,000,000 by 1965. Suburban rapid transit facilities

are now furnished entirely by the trunk-line railroads in trains operated over the same tracks that are used for other types of railroad business. Commuter traffic has been increasing at a rapid rate and now presents so serious a problem for the railroads that it is generally admitted that special facilities for it must be created within the central part of the region. If the special suburban rapid transit facilities proposed within the central areas are carried out to tap the railroad lines beyond these terminals the latter would be enabled to deal adequately with the needs of long-distance travel, which was originally their primary function.

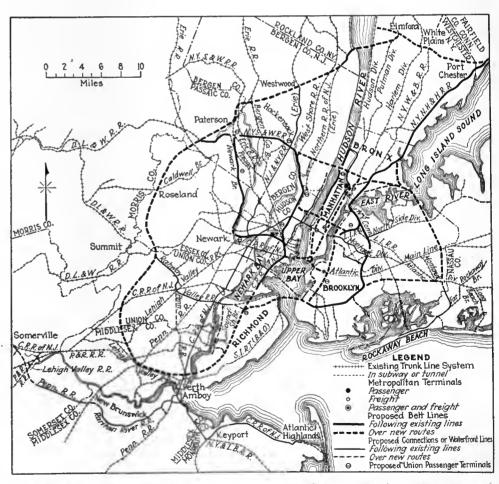
The proposed suburban rapid transit system has been developed with regard for its relationship to the other features of the Regional Plan, especially the existing and proposed trunkline railroad and city rapid transit systems. The locations of existing and future sub-centers, the proposed highway system, and the

best utilization of land have all had an important influence on the selection of routes.

The first step proposed is a loop connecting Manhattan and New Jersey, hooked up on the east with the Long Island Railroad and on the north with the New Haven and the New York, Westchester & Boston, as shown on the map on page 696. This will require tunnels under the Hudson at 57th Street and at a point near the Battery, and other tunnels under the East and Harlem Rivers, as well as a deep level subway in Manhattan.

The ultimate plan presupposes the electrification of most of the railroads handling commuter traffic or the substitution of additional trackage for electrical operation, either under, over, or adjacent to the existing railroad rights-of-way. In New Jersey it would include an area within a radius of about 20 miles from the New York City Hall and in Westchester and Nassau Counties in New York an area within a 25-mile radius from the City Hall.

At the beginning commuters coming in from New Jersey on existing railroads not yet electrified will have to change cars in order to enter the main system, but as



A series of belt lines covering the entire area is proposed as a means of co-ordinating the terminal operations of the trunk line railroads

up the east side under the Bowery and Third Avenue. Practically all of it will be underground. The third loop Fishkill will serve Brooklyn and Queens, connecting with the Long Island at Long Island City and reaching the New York Connecting Railroad at Woodside. Each of the inner loops will be linked up with the outer belt lines. Passenger service will be provided for by great new terminals. New Icrsey will have six on the inner belt line—at Paterson, Hackensack, North Bergen, Jersey City, ISLAND SOUND Neta or Hills LEGEND Metropolitan Loop Other Routes

••••• Metropolitan Bypass Diagrammatic scheme of highway routes. This plan includes a highway loop, a roughly rectang-ular system of routes within the loop, and circumferential, radial connecting routes. actual application of this scheme to the contours and present development of the land with the greatest feasible usage of existing highways is shown below the railroads from the North and East are already elec-ATLANTIC trified their trains can be shunted at once into the new LEGEND tunnels. Under unified oper-Express Highways and Metropolitan Laop aver existing rights-of-way Express Highways and Metropolitan Loop over new rights-of-way ations trains can be run through the entire system, Other majar highways over existing rights-of-- Other major highways over new rights-of-way from one end to the other, Existing boulevards and parkways so that the switching and ***** Proposed boulevards and parkways existing and new rights-of-way

storing of empty cars will be reduced to a minimum. All the available rolling stock in the region can be mobilized at

any time where it is most

needed. These proposals coincide in general with plans previously advocated by the North Jersey Transit Commission and the Port of New York Authority.

To meet the growing needs of trunk-line railroad freight traffic the plan begins by laying down an outer belt line, passing around the heart of the region, through New Jersey, Long Island, Westchester County and a corner of Connecticut, at an average distance of about 20 miles from the City Hall. All railroads entering the region will be connected with this belt line, which will be partly new construction and partly along existing railway routes. By means of this belt line and its connections any car from any railway can be switched to any point along the outer rim of the region. Car ferries will become obsolete.

Three inner loops are proposed. One will circle the Jersey shore opposite Manhattan. A second will run down the west side of Manhattan to the Battery and

Newark, and a point in Clifton southwest of Passaic. Manhattan will have a new terminal in the neighborhood of 178th Street and Amsterdam Avenue and probably another at 60th Street and the Hudson River. The Bronx will have a terminal at 149th Street and Mott Avenue. Queens will have one near Queens Plaza, Brooklyn will have one near Prospect Park Plaza, and one is planned south of Port Richmond.

00000 Existing Ferries

To Point Pleasant

By the aid of these terminals and the lines which will serve them, a passenger coming into the region by trunk-line railroad will be taken directly without change of his means of conveyance, to any community in the 50-mile radius.

Like the railway and rapid transit systems, the proposed highway system for the region is based upon a loop, or series of loops. The principal one of these will run at an average distance of about 12 miles from the New York City Hall. Three inner routes will supplement the loops. Nine north-and-south routes are indicated. Two of these will traverse Manhattan, following the lines of the west side elevated speedway, already authorized, and the proposed east side bouleward. Five will run through New Jersey. One, starting in Richmond Borough, will pass through Bayonne and run close to the west bank to the Fort Lee Bridge. Others will roughly parallel it further to the west, giving New Jersey cities convenient north-and-south connections. The remaining two routes will be on Long Island.

Twenty "radial routes," extending outward from the loop, will tap Long Island, Westchester County, parts of Connecticut, the upper Hudson along both banks, Western and Southern New Jersey, and the Interstate park and other recreation areas. The main routes will be devoted to express traffic, and taken as a whole will enable through travel to bypass the points of greatest congestion.

In addition to the new highways the report proposes a chain of parkways and boulevards encircles the entire region. Thirty-nine major routes are suggested, connecting the important outlying parks and swinging in a great circle around New York City from Long Branch, N. J., to the south shore of Long Island. These are so planned as to take advantage of the existing scenic

opportunities, following river and shore lines wherever possible and traversing the Watchung and Ramapo Mountain chains and the rolling country of Westchester and Long Island.

The proposals include an almost continuous ring of open spaces, encircling the region. The recommendations for the more congested centers of the region are limited by the prohibitive expense of the land in most cases. The report also suggests that the value of water reservations, private golf courses and even cemeteries as "lungs" for the city population be taken into consideration.

A further source of breathing space, as well as an adjunct to the transportation system, will be the airplane landing field. The report advocates the purchase, as soon as possible, of sufficient land for sixteen civil airports, in addition to the 22 airports of all kinds now existing in the region.

Though no figures were given out as to the cost of carrying out the plan, it is believed that they will run into the billions. The total expense, however, probably would not exceed the cost of emergency measures which would have to be taken to meet the needs of the growing city if no general plan existed, and in the long run the plan would undoubtedly result in large economies for the region as a whole and for every community affected.

Acceleration Rates Compared for Gas-Electric and Mechanical Drive Buses

By W. H. McLaughlin General Engineer Westinghouse Electric & Manufacturing Company

IN ORDER to compare the advantages of electrically driven and mechanically driven buses, tests were made by the Westinghouse Electric & Manufacturing Company on a chassis equipped first with one type of drive and later with the other. The results are thus entirely

comparable because the same engine was used throughout and the difference in the total weight represents the fundamental difference between the conditions of the tests. A graphic picture of what occurred during the acceleration of the two buses, is given in accompanying curves, in which the results of the test have been summarized. These show the performance of the mechanical drive using the four speeds of a standard transmission and portray the average initial delay as actually measured. The various "steps" in the acceleration are due to the loss of bus speed while the operator is shifting gears. The curve clearly indicates the changes in the acceleration rate during the gearshifting operations, and also the manner in which the engine speed varies during acceleration. The engine speed reaches a maximum of approximately 1,800 r.p.m. and falls to about 1,000 r.p.m. each time the gears are shifted. During this period the engine is dis--connected from its load about 25 per

cent of the time in order to shift the gears. This loss of power causes a corresponding loss of bus speed.

An average gas-electric test with this engine has also been plotted. The data were taken from comparable tests conducted by the same men over the same course

as for the mechanical drive. The acceleration is higher than for the 30 mechanically driven bus and the rate is not 25 changed suddenly. rough or jerky accelera-Hour 50 tion frequently gives the impression of being rapid. The error of this e 15 impression is easily seen 20 24 2000 1,600 E d 1,200 8 12 Seconds D. 800 Performance records of mechanical and gaselectric driven buses, as shown by tests 400 Gear ratio: Mechanical, 5.96 to 1 10.3 to 1 Gas electric, 1 Wheels, 36-in. 12 lo Seconds

when a comparison is made of distance covered by the two drives at definite times after starting. This is shown by the following table:

Time in Seconds	Gas-Electric Trav	eled in Feet—— Mechanical
10	144	93
20	468	365
25	671	552
30	900	772

The engine revolutions per unit of distance traveled are fewer for the gas-electric than for the mechanical bus. The data in the following table were taken from the curve:

	-Engine Revolutions for 100 Ft.				
Time in Seconds	Gas-Electric	Mechanical			
10	154	220			
· 20	98 ·	120			
. 25	88	110			
30	82	89			

The difference in engine revolutions per mile increases as the stops per mile increase. This is due to two factors. The engine on the mechanical bus is usually raced while shifting gears. The engine in the gas-electric is idling during coasting and braking, while in the mechanical it operates at a speed proportional to bus speed, unless the clutch is released or the gear shifted to neutral.

A bus equipped with gas-electric drive will weigh from 10 to 15 per cent more, and cost from 15 to 20 per cent more, than a similar mechanical job. To offset this increase in cost and weight, however, the advantages previously mentioned are obtained.

Traffic Problems Topic of New York State Meeting

LIVELY discussion of the problems of traffic and transportation in city streets occupied the greater part of the sessions of the 47th annual meeting of the New York Electric Railway Association held at the Hotel Champlain, Bluff Point, N. Y., June 21-22. This subject was introduced by the first speaker, Ernest Murphy, general manager, United Traction Company of Albany. After emphasizing the seriousness of the traffic problem as it exists today, he pointed out that the passengers in public transportation vehicles are not organized as are the majority of riders in private vehicles, the retail merchants, and other interests. Moreover, city officials ordinarily are not qualified by experience to act as representatives of the street car and bus riders. Hence, the railway manager must assume the duty of acting as representative of the riding public in the solution of traffic problems. Vehicular congestion, as it effects the street car rider, was discussed by E. K. Miles, superintendent of transportation, New York State Railways, Syracuse. He brought out the fact that parking and improperly arranged traffic signal lights are the greatest causes of congestion and delay. To secure relief, it is essential that the solutions proposed have the approval of both the general public and the city officials.

Advantages of the electric railway over other means

of transportation were emphasized by J. Rowland Bibbins, consulting engineer, Washington, D. C. He pointed out that the transportation problem is essentially a rushhour problem. At present buses are handling only a comparatively small portion of the total traffic of the large cities in this country. In New York, Chicago, and Philadelphia, they carry about 5 per cent of the traffic, in Boston, 10 per cent; and in Detroit, 19 per cent. According to Mr. Bibbins, the reason for these small percentages is that the total volume of traffic is too large to be handled effectively except by rail. Roadway space is inadequate to handle rush-hour crowds of ten to fifteen thousand passengers per hour on a single route. More and wider streets would be required to handle this volume of traffic by bus. Speed is the most important element in transportation, and buses are slower loading than are street cars, according to Mr. Bibbins. Moreover, because of their greater power, street cars can accelerate faster than buses-another advantage in handling mass transportation. In conclusion, Mr. Bibbins pointed out that proper traffic signals are essential to speedy transportation, and outlined some of the principles to be followed in designing signal systems.

John McLean, attorney, United Traction Company of Albany, spoke on the subject of rights of street cars, and urged the railway men to make greater efforts to put their case before the public. Bus operation in Buffalo was described by J. C. McCollum, executive assistant,

International Railway.

That the present condition of the local transportation industry is a challenge to private management was the opinion expressed by Miles B. Lambert, Westinghouse Electric & Manufacturing Company. He said that the problems of today are exceedingly complex in character and, in many instances, are not thoroughly understood. Further scientific research is needed to solve them satisfactorily. He advocated wider use of technical experts by the railways in meeting these problems.

Contributions made by the manufacturers to the efficiency of the street car were discussed by Cornell S. Hawley, president, Consolidated Car Heating Company, R. H. Sjoberg, General Electric Company, and Raymond Boiselle, Westinghouse Traction Brake Company. Passenger safety was the subject discussed by W. H. Hyland, claim agent, Fonda, Johnstown and Gloversville Rail-

road, the last speaker on the program.

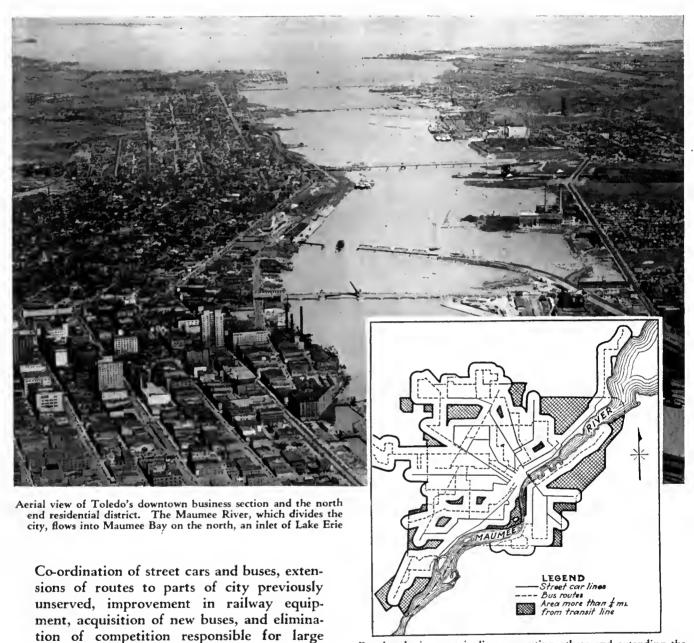
Officers for the coming year were elected as follows: President, Ernest Murphy, general manager, United Traction Company of Albany; first vice-president, R. R. Hadsell, general manager, Schenectady Railway; second vice-president, G. W. Jones, vice-president, Brooklyn and Queens Transit Corporation; third vice-president, B. J. Youngbluth, president, International Railway; secretary and treasurer, W. S. Stanton, Rochester.

The meeting concluded with a banquet, Saturday evening, at which the speaker was James B. Rice, representing Mayor Houde of Montreal.

Coming—An interesting analysis of the relation between the length of traffic signal cycles and the efficiency of street use.

Modernized Toledo System Making

Real PROGRESS



By abandoning certain lines, rerouting others and extending the bus system, the Community Traction Company has covered all but a few areas within the city limits by its service

OLEDO'S transportation outlook, rather gloomy for a long period of years, is now beginning to appear unusually bright. At least it must be assumed to be brightening when the figures month after month show large increases and continue to establish new records. And that is just what the figures of the

increases in revenue

The actual "proof of the pudding," of course, lies in

Community Traction Company are doing.

the figures as they are shown in the company's reports. Passenger revenue for 1928 was \$3,479,628, compared with \$3,251,198 for the previous year, and revenue passengers totaled 48,230,315, compared with 45,503,270 in 1927. Total revenue from all sources showed an increase of \$259,288 over the previous year. The most remarkable increase was in bus patronage which soared from 2,795,052 in 1927 to 6,150,851 in 1928. For the

twelve months ended April 30, 1929, the total passenger revenue was \$3,360,797, or 12.9 per cent higher than the year before, and the total revenue passengers carried was 50,685,350 or 11.8 per cent higher. These figures are the more encouraging when the percentages for the twelve months ended April 30, 1929, are compared with the per cent increases for the first four months of 1929. Passenger revenue for the four months combined shows an increase of 16.31 per cent over the corresponding period in 1928, while revenue passengers show a 15.01 per cent increase. The company has expanded its service steadily since the middle of 1928, but in spite of this has managed to keep its operating expenses down. In fact, during 1928, the operating costs were reduced from \$2,044,191, the 1927 figure, to \$2,018,119, while the company made an increase in service of 10 per cent.

As a result of the increased revenue and decreased operating expenses there has been an appreciable increase



Part of the new \$150,000 garage, where the bus maintenance and servicing activities for the company's large fleet are centralized

in earnings. The turning tide has changed the figures from red to black, and the company, with its financial set-up again adjusted, is getting back to a sound basis. A net surplus of \$64,234 was realized for the first quarter of 1929, after meeting all obligations, while for the similar period in 1928 the company was faced with a deficit of \$5,254. For the entire year of 1928, the surplus, after all operating expenses, taxes, and charges had been deducted, was \$125,150, which compares with a deficit of \$361,825 for the previous year. Present indications are that this progress is not temporary, but that it will continue in the future.

Perhaps the greatest accomplishment has been the restoration of the faith of the city officials and the public, and the conversion of a strongly antagonistic feeling into a friendly one toward the company. The public is now interested in its transportation system and is responding heartily to the railway's expansion and modernization program.

The upward trend in revenue passengers is the answer of the public of Toledo to the railway's endeavor to give better service. Of the many steps taken by the railway, the most important ones were the abandonment of superfluous routes, the establishment of new routes in districts previously unserved, the expansion of its bus system, a complete co-ordination of the entire rail and bus system, the installation of extra motors on the street cars, re-scheduling service, and the reconstruction of a large amount of track. Along with these major moves the company arranged for special bus service, established owl service with buses, repaired bridges, eliminated grades, built a large garage and centered its bus activities in it, lowered its accident claims and resulting charges by instituting a safety drive, reduced its operating expenses, designed new transfers, rearranged car stops, marked the new stops with bright orange bands, and provided safety zones. Every effort was made to offer the maximum of service to the greatest number of people in Toledo.

NEW AGREEMENT MADE WITH CITY

The general rehabilitation program, sponsored by the railway, followed the passage of an ordinance in June, 1928, supplementing the Milner service-at-cost franchise and giving the Community Traction Company a virtual monopoly of all local transportation facilities in the city. The new ordinance settled a number of issues which had been discussed without success for years. The original Milner service-at-cost ordinance, adopted by the electors on Nov. 2, 1920, proved unsatisfactory in several particulars. The city asserted that the company was not willing to do its share toward its comprehensive street rebuilding program, and the company asserted that the city had been remiss in permitting bus competition free from the limitation of service-at-cost regulations.

The company found itself in the anomalous position of operating superfluous routes while unable to start routes that were needed in new areas. Again, the city maintained that the company was paying too high a rate for power, while the company felt that its yearly reconstruction program was limited too much by the ordinance provision that replacements were to be financed from a depreciation fund, accrued from earnings, amounting to not less than one-half of 1 per cent nor more than $1\frac{1}{2}$ per cent of the capital value. Other differences of viewpoint complicated the whole situation. Several attempts were made previous to 1928 to amend the Milner franchise which became effective in 1920. First came the Bartholomew report, then the Riggs report, and finally the supplemental Riggs report. Although there were earnest attempts to solve the transportation difficulties, no direct results were obtained from them.

By the end of 1927, however, bickering over the Milner ordinance had to come to an end in favor of constructive measures. During the first half of 1928, a number of conferences between the city and company officials were held, and the new ordinance was formulated. It was heartily endorsed by Mayor Jackson and when submitted to the City Council was passed by a vote of 17 to 1. It was approved by the Mayor on June 5 and became effective July 5.

The ordinance is, in effect, a 5-year modification of the original Milner ordinance. It gives the railway practically a monopoly of all local transportation service in Toledo by prohibiting any transportation line within onefourth mile of a Community Traction Company car or bus line, and also provides for a substantial reduction in the power rate to the railway. The power rate was reduced to $1\frac{1}{4}$ cents flat per kw.-hr. and a rebate for the past power bill amounting to \$150,000 was allowed. In exchange for these terms, the company agreed to pay an old pavement bill amounting to \$185,241 with interest at 6 per cent, to pay for a traffic survey which cost \$25,000, to set up a five-year reconstruction program amounting to \$560,000, to establish a special replacement fund of \$230,000 to be advanced against the depreciation fund and refunded after the third year, and to secure a loan of \$30,000 for a down payment on new buses.

The Community Traction Company also agreed to a loan of approximately \$900,000 for ten years without interest to cover the accrued deficit in the stabilizing fund, exclusive of the original \$400,000 in the fund. It also agreed to reroute the existing lines, to abandon non-

which is more than double the figure of July, 1926, of 61.43 miles.

The bus routes for the most part are feeders to the street car lines or lines which do not compete with the trolleys. The whole plan was to co-ordinate the two systems so that a maximum number of people could be served without unnecessary duplication of facilities. The accompanying map, showing the area in the city limits within a quarter of a mile of a transportation line, shows how successfully the rerouting and extensions were in covering the city. The hatched areas on the map, which are not within one-fourth mile of any line of the Community Traction Company, are for the most part parks, institutional grounds, cemeteries, etc.

In January, 1928, a total of 3,787,459 passengers were carried on the 54.1 miles of street car route, averaging 70,021 passengers per mile of route. In January of the following year the rail routes were only 46.9 miles,



Street scene in downtown section of Toledo. Many of the company's cars have been re-equipped with four motors, giving them ample power for rapid acceleration in traffic

essential lines and to expand its service into new areas, all at the standard fares of ten cents for a single ride, three tokens for 25 cents, and 1 cent for a transfer.

Realizing that its superfluous routes in certain districts and its lack of routes in other districts were causing an unnecessary operating expense and at the same time failing to secure the maximum of patronage, the company set as its major objective the rerouting of its lines, reaching into new territory with buses, and fully co-ordinating the two types of service.

In July, 1926, the rail routes totaled 57.43 miles while the bus lines were only 4 miles. In the ensuing twelve months the bus mileage was increased to 30.6 and the following year to 58.0 miles. Following the passage of the ordinance supplementing the Milner franchise, further extensions were made bringing the total bus mileage to 78.5. During the same period, the rail mileage was decreased 11.14 by reroutings and abandonments of lines that really could be better operated with buses. At the present time the total rail and bus mileage is 124.79

but 3,895,821 passengers were carried, making an average of 83,101 passengers per mile of route. The increase in passengers carried per mile of route was due to the new system of using street cars for the heavy routes of travel only and feeding them by bus with passengers from the outlying districts.

Buses Show Passenger Increase

A corresponding increase in passengers per mile of route was obtained with the buses, even during the rapid period of expansion in 1928. In January of that year buses covered 32.4 miles of route and carried 373,306 passengers, or 11,522 passengers per mile. In January, 1929, the bus mileage was 68.3, but 1,149,233 passengers were carried, or 16,826 passengers per mile.

Prior to June 30, 1928, there were six independent bus lines competing with the Community Traction Company. Under the terms of the ordinance giving the railway a monoply of the bus service, the independents were forced to sell out. The six lines were purchased from the independents on a property valuation basis under the terms of the ordinance. A total of 40 buses were bought but only a few were serviceable.

To give the new service, the Community Traction Company purchased, during 1928, a total of 88 buses, of which 69 were new. The new buses included 3 Macks, 18 Whites, 38 Yellows and 10 Twin Coaches. These buses, which cost approximately \$900,000, brought the fleet to a total of 124 at the beginning of 1929. A new garage was built at a cost of \$125,000 for the purpose of centralizing maintenance and operation activities.

In addition to the numerous extensions made, the company established special services with some of its new buses. In a single month special buses operated for high school students carried 18,000 passengers and brought in a net profit of \$520. The revenue of 40.074 cents per mile was the highest in the entire bus system. The buses also were substituted for street cars for owl service on certain lines, resulting in lower operating costs.

HIGHER SPEED WITH EXTRA MOTORS

By adding two 35-hp. motors to 58 Peter Witt cars already equipped with two motors of the same size, the company was able to speed up its service on several lines. On the Cherry Street line the extra motors permitted the terminal schedule speeds to be raised as follows:

SCHEDULE SP	EEDS IN MI	LES PER HOUR	
	Old	New	Per Cent Increase
Morning peak	9.84 10.17 8.72 10.17	10.53 11.09 10.34 11.09	7.02 9.05 18.58 9.05

Incidentally, with this increase in speed came an increase of 14.3 per cent in traffic for the period from April, 1928, to February, 1929, as compared with the same period of the year previous, and a 17.5 per cent decrease in platform expenses.

Another factor in raising the speed on several lines was the rearranging of stops to give longer runs between them. When the new stops were put into effect, the schedules were announced by pamphlets. As a further aid the new stops were marked with brilliant orange stripes around nearby poles at the curbs, the color conforming to that of the cars. Two more steps to help increase the speed were the establishment of safety zones in a business district of the city and the designing of a new system of transfers. In this system colors indicate groups of parallel routes while the hour is indicated by the length of the transfer. While the new transfers shorten the time of issuance appreciably, they also have been responsible for an 8 per cent increase in purchases of the regular token fares. This is the result of the elimination of a certain amount of return riding by means of transfers.

EXTENSIVE TRACK RECONSTRUCTION PROGRAM

One of the most important provisions of the ordinance which went into effect in July, 1928, was the setting up of a 5-year track rehabilitation program, involving a sum of \$560,000. The amounts available for this work were to be \$185,000 for the first year, \$181,000 for the second, \$57,000 for the third, \$119,000 for the fourth, and \$80,000 for the fifth. These sums were to be in addition to the \$230,000 appropriated for the replacement of worn out equipment in a period of

three years. A great amount of street improvement work has been completed and other projects are well under way. At the end of the 5-year period, the company will have most of its track in excellent condition. Aside from actual track reconstruction the company has also eliminated a few grades and repaired some bridges.

Among the numerous steps taken by the company to move forward was the institution of a safety drive which has resulted in a very substantial reduction in accident claims and resulting charges. In the maintenance department, too, every effort has been made to lower the cost and to improve the equipment. That the equipment has been improved is best evidenced by the fact that pull-ins in 1928 were 40 per cent less than those in 1927.

PUBLIC RESPONDS TO COMPANY'S EFFORT

The results of the many improvements made by the Community Traction Company to better its service, reviewed at the beginning of this article, indicate that the public is responding favorably to the modernized system. The company has enjoyed increases in passengers and revenue every month since the supplemental ordinance went into effect in July, 1928, and no doubt traffic will continue to build up in the succeeding months and years.

The increased earnings and the financial readjustment provisions of the supplemental ordinance have changed this aspect of the operation materially. Prior to 1928, the earnings were falling off, riding was steadily decreasing and the deficit in the stabilizing fund, established under the terms of the Milner ordinance of 1920, was growing larger each month. In March, 1928, the company made its last sinking fund payment, retiring 20 per cent of the capital value. This sinking fund was established by the Milner ordinance to retire \$1,800,000 of the 6 per cent bonds of the company and to issue an equivalent par amount of common stock to the city. The payments of $2\frac{1}{2}$ per cent of the capital value amounted to approximately \$28,000 each month. Relieved of this obligation the company was able to show a surplus the following month.

At the time the supplemental ordinance was passed the deficit in the stabilizing fund was approximately \$1,300,000. To take care of this a provision was included for a loan to the railway amounting to approximately \$900,000, representing substantially the deficit in the stabilizing fund exclusive of the \$400,000 originally placed in it. Interest on this loan and payment of principal was suspended for a 10-year period subject to a shorter period should the agreement with the city be terminated. Because of the extensions of these payments it was agreed to place all surplus into a so-called "fare stabilizing fund," and to readjust the fares when this fund reaches \$500,000. At the first of the year the fare stabilizing fund had reached a total of \$65,032, making the actual deficit in the reserve fund \$1,147,217.

The first four months of the present year showed surpluses of \$18,789, \$25,767, \$17,634, and \$20,833, respectively, raising the fare stabilizing fund to \$148,055 and reducing the actual deficit in the reserve fund to \$1,064,194. The lower power rate, the rebate of \$150,000 for power, the lower accident charges, the lower operating expenses and steadily increasing revenue make the prospects for reducing the deficit in a comparatively short period and putting the company on a sound financial basis again, appear exceedingly bright.



Electric coaches have no difficulty in negotiating the 10 per cent grade of Capitol Hill in Salt Lake City at a speed of 17½ m.p.h.

Trackless Trolley Questions

Riding has increased steadily on Salt Lake City line. Minor difficulties which were experienced have been overcome. Operating costs are lower than for motor buses or street cars of the same capacity

ANY interesting developments have taken place since the inauguration of trackless trolley service in Salt Lake City on a 4.3-mile route on Sept. 9, 1928. It was recognized at the outset that there would be problems to meet in pioneering this new conception of the trackless trolley and a few difficulties actuall did arisc in connection with the operation of the ten original coaches. However, the troubles were all of a minor nature and were overcome one by one. No fundamental difficulties were encountered, so that no concern is felt regarding the ultimate outcome. The operation as a whole has been entirely successful and has met with favorable public and official sentiment; in fact, because of the public's attitude the company plans to operate a second line on Ninth East Street, in place of the present railway service. Permission has been granted by the City Commission of Salt Lake City and the line will be established as soon as the Public Utilities Commission of Utah approves the abandonment of the car line and the substitution of trackless trolleys.

Answered from Experience

 $\mathbf{B}\mathbf{y}$

EDWARD A. WEST

General Manager Utah Light & Traction Company Salt Lake City, Utah

In the Sept. 8, 1928, issue of Electric Railway Journal the underlying reasons for the adoption of the trackless trolley for service in Salt Lake City were discussed. In a later issue—Fcb. 9, 1929—an article was published, reporting the progress of the new service and giving details of the overhead and the ten "electric coaches," manufactured by the Versare Corporation. In February, however, the company had not had sufficient experience with the coaches to discuss with certainty the many phases of operation and the results of the new service. With nine months of experience, it now feels in a position to answer the many questions which have been asked regarding the various phases. The more important of these questions with the answers follow:

Q-Do you recommend trackless trolleys for use on unpaved streets?

A.—This depends altogether on climatic conditions and the character of the roadbed. Experience in Salt Lake City indicates that operation on dirt streets is not satisfactory. During those seasons of the year when ruts are formed in the street surface from thawing and freezing, riding on the coaches is rough and vibrations are set up in the body which loosen electrical connections. A great deal of this difficulty doubtless would be eliminated by a more general method of insulating equipment from shocks, and steps taken along this line are proving effective. Of course, any

ing an intersection when an automobile approached it from the right at a high rate of speed. Had the coach been a street car confined to rails the automobile would have struck it head on in its midsection, with disastrous results. As it was the coach operator, because of the flexibility of the unit, was able to steer sufficiently from the path of the oncoming automobile to enable the driver to retard the speed of his car somewhat and to pull it to the right, with the result that only the front sides of the vehicles met. When it was found that the coach had been dam-

ing in some patrons becoming timorous. The incidents were as follows: One morning a horse-drawn milk wagon was driven slowly from a side street right into the path of a coach coming down the hill. The street was covered with ice. The operator of the coach swerved to the right to avoid hitting the milk wagon and in so doing pulled away from the trolley wires and onto a street with a very severe downgrade. He steered the coach into the curb and a barn crew had to right it and let it down to a street at a lower grade, from where it was pulled into the barn. No aged slightly it was pushed over to personal injuries resulted and the the curb, where it did not interfere only damage to the coach was a



Trolley wires for the electric coaches, installed along the sides, are less conspicuous than wires over the center of the street

type of road vehicle is subject to the same difficulties with unpaved streets.

Q-How flexible in traffic are the electric coaches? Is this flexibility an advantage?

A.—Coaches have a great amount of flexibility in traffic, giving them a decided advantage over the fixedroute vehicles. The following incidents show the desirability of flexibility in heavy traffic: At a busy intersection during the rush hour one evening an automobile became entangled with a street car, the front wheel of the automobile becoming wedged under the car. A coach was following the street car, and instead of waiting until the street car could be freed and proceed, the coach's trolley poles were pulled and it passed around the street car and continued on its way.

At another time a coach was cross-

with other traffic. Just recently it was necessary to replace the special work at an intersection, necessitating a teniporary rerouting of all lines. To reroute the coaches three blocks of temporary overhead trolley construction was installed in a short time and at small expense. This rerouting would have been impossible with street cars.

Q-Did you experience any difficulty negotiating Capitol Hill with its 10 to 11 per cent grade during the winter months?

A.—At the beginning of the winter season electric coach operators were recruited from street car service, and those selecting coach runs were not experienced in handling rolling stock not confined to rails. On two different days incidents occurred which. on account of the newness of this type of vehicle, were given undue and unnecessary newspaper publicity, resultbroken corner post and a front window.

After a week of successful operation under similar street conditions, a second incident occurred. A new man, under instruction, who had driven gasoline buses in the suburbs of the city made a run for the grade but the rear wheels started spinning. To gain traction he backed up and tried it again. In each case he fed the motors too rapidly, with the result that the wheels spun. After these unsuccessful attempts to make the hill he decided to back the coach over to the curb and in so doing backed into an automobile, damaging it to the extent of \$300. Very little damage was sustained by the coach itself.

Local newspapers, however, played up the incident to such an extent that a number of people were frightened. Because of this the company took the coaches off the hill for a period of 60

days. At the end of this time operation over the same icy streets was resumed without further trouble. The experience last winter showed that a light sprinkling of cinders or sand and salt on an icy street effectively prevents slippage. The sprinkling can be quickly and economically done by special equipment for the purpose.

Q-Of what value on grades are dynamic brakes if the trolleys leave the wires?

A.—They are of no advantage. It would be necessary to rely in such cases on air and hand brakes, which in the case of gasoline vehicles are the only brakes available anyway. Thousands of heavy trucks and buses are running over streets of cities throughout the country today equipped with brakes that are no better, if as good, as the hand and air brakes on the The trolley poles electric coaches. leave the wires so infrequently, however, that it is not worth considering.

O-Do you prefer dynamic brakes to other forms of braking?

A.—Inasmuch as dynamic braking requires but little additional equipment and has many advantages, no reason can be seen for eliminating this method of control. Among its advantages are the following:

First, dynamic brakes are effective on grades for holding the speed of the coach at practically any rate desired. This is decidedly advantageous when streets are slippery.

Second, the heat generated in accelerating and braking is utilized to heat the interior of the coaches, thus saving power in the winter.

Third, wear and tear on brake drums is minimized.

Fourth, a coach can be brought to a sudden stop in emergencies.

Fifth, rapid acceleration and retardation give to riders the effect of speed and "getting somewhere" that is necessary nowadays.

Q-Have you experienced any equipment and operating difficulties!

A.—For a new mode of mass transportation surprisingly few equipment difficulties have been experienced. Dynamic braking introduced some strains and stresses that are not present with ordinary braking and, being performed through the springs, caused some spring trouble at first. Supporting the springs in rubber permitted a reduction of the number of leaves, which improved riding and reduced vibration in the electrical and air equipment.

Operating difficulties were due largely to trolley dewirements at the

outset on account of running the coaches through overhead special work used by street cars. The trolley wheels of the coaches were of different diameter than those of the street cars, therefore it was necessary to change the grooves in the overhead special work to accommodate the coach trolleys. These difficulties cleared themselves rapidly, coach dewirements being no more frequent than with street cars at the end of two weeks. The use of mechanical and electrically - operated overhead switches permits coaches and street cars to take turnouts with equal facility, so that overhead problems, locally, gasoline bus of carrying capacity equal

costs will be lower than at present. There is now reflected in the costs the expense of overcoming minor difficulties always accompanying pioneering. During the first few months more inspection and supervision were given than are found necessary today. During the winter the cost of keeping the ruts out of the dirt street portion of the route was rather high. This expense is in no way chargeable to the coach operation so far as the equipment is concerned, because it was done more to improve riding than for any other purpose.

Regarding fuel and energy costs, a



Carhouse pits were readily adapted at small cost to meet the needs of electric coach inspection and maintenance

are solved. At one end of the route an overhead wyc is installed which is negotiated without difficulty; at the other end a loop is used. As in street car operation loops are more desirable and are favored wherever possible. Each application of trolley coaches, however, will bring up its own set of problems. In Salt Lake City, nevertheless, it is felt that operating coaches along with street cars through the busiest traffic of the city with turnouts at every corner has overcome the majority of the overhead difficulties likely to be encountered.

Q-How do coach operating costs compare with those of gasoline buses of equal seating capacity?

A.—Based on carrying capacity the operating cost of electric coaches is 63 per cent of gasoline equipment. It is felt that by the end of the first year

to that of the electric coach averages about 3 miles per gallon, while the coach consumes slightly more than 2.2 kw.-hr. per mile on an average.

Q-How do electric coach costs compare with those of street cars of equal seating capacity?

A.—It is felt that electric coach operation over a period of time will show a substantial saving over street car costs. During the first six months the electric coach costs were 80 per cent those of street cars. There are a great many hidden costs in connection with street car operation not always reflected in the figures. For example, there is the periodic rehabilitation of track and paving which is usually accomplished by retiring the original investment and charging it to depreciation reserve and capitalizing the new work. As a result of this accounting procedure, operating accounts do not reflect the full cost of street car operation. Those companies that provide adequately for depreciation in their operating accounts are best situated to make a direct comparison between street car and electric coach operating costs. Electric coaches were introduced in Salt Lake City to avoid rehabilitating a long section of track and pavement that needed replacing. Tire expense of coaches takes the place of wheel and track and roadway street car costs. If tire expense is

less conspicuous today than they were in the middle of the streets. The foliage of the trees hides the wires and the appearance of the roadway is so much improved that this, together with the quietness of the coaches, has made this type of operation very pleasing to the property owners. It has been stated that building activity in the residential section of the city served by the coaches has been stimulated.

With respect to overhead construction in the downtown district, it has



Ten electric coaches of this type, manufactured by the Versare Corporation and equipped with Westinghouse motors and control, are operated on the Salt Lake City route

less than the sum of these, then there is no question that electric coach operation is cheaper.

Q—What is the actual electric coach kilowatt-hour consumption per carmile as compared with that of street cars?

A.—Energy consumption of coaches averages slightly more than 2.2 kw.-hr. as compared with approximately 4.3 kw.-hr. for street cars. This coach average is for winter operation through snow, ice and mud, and should decrease somewhat during the months of more favorable weather.

Q—Have tire troubles interfered with service?

A.—Delays on account of tire trouble have been so few as to be almost negligible.

Q—What objections, if any, were made by property owners to stringing double trolley wires on the streets in residence districts?

A. There were no difficulties connected with this installation as far as the residents on the streets were concerned; in fact, the trolley wires are

added weight to the installations already in place at intersections but is no more noticeable than the single trolley wire construction. In fact, a stranger going along the main street of the city after coming from a city having no trolley coaches would not know the difference. It requires an experienced eye to note the double overhead. At the outset there was some question by the fire department as to its ability to use tower wagons and other fire apparatus on account of two trolley wires. To overcome this an actual test was made by the line department of the street railway in company with the fire chief and his assistants. Following the test the chief withdrew all objections to the presence of two trolley wires.

Q—Can the vehicles be maneuvered about the carhouses and shops without difficulty?

A.—Fortunately it was possible to work out an overhead system in the yards which will permit increasing the number of trolley coaches to the full capacity of the carhouse without any particular overhead complications.

One of the tracks in the carhouse was assigned to the electric coaches and converted for their repair. The pits were partly bridged with platforms to permit inspection of coaches, and double trolley wire was extended over the pits and track. Alemiting equipment and lines for greasing the coaches also were installed adjacent to these pits. Later on, when the number of coaches was increased, a second track was converted. coaches enter the carhouse at the west end and leave by the east end. There is sufficient room in the building for one coach to by-pass another, to go over the pits or to leave the barn at the east end.

Q—Arc electric coaches speedier on grades than street cars and gasoline buses?

A.—Yes. On the 10 to 11 per cent grade on Capitol Hill, with load of 40 or more passengers, coaches average better than $17\frac{1}{2}$ m.p.h.

Q—Do electric coach accidents show an increase over street car accidents?

A.—The flexibility of the coaches permits them to deviate from a fixed path to avoid serious collisions. Their ability to stop quickly also is a safety factor of inestimable value.

Q.—IVho licenses trolley coaches for operation on the streets of Salt Lake City?

A.—The tax for this operation, other than that based on property value, amounts to \$25 per year per vehicle, the same as for street cars, and is payable to the city. No state license tax or vehicle registration number is required because the coaches are not self-propelled. They are confined to definite routes and obtain their energy for propulsion from an outside source, so they are classified with street cars.

Q—Has patronage on this line been affected by the introduction of electric coaches?

A.—From the outset riding on this line showed an increase over the former patronage. At first it was thought this was due to the novelty of the vehicles, but after more than nine months of operation with riding still continuing it is believed that the quiet, speedy operation of the electric coaches has brought new patrons. This is particularly interesting in view of the fact that parallel street car lines are almost a half mile distant on each side. The system as a whole shows a decrease in riding, but the electric coach route has had a substantial gain in patronage.

Monthly Financial Reports Show Improvement

Operating statistics of 31 electric railways in the United States and Canada indicate a trend toward higher gross revenue and reduced expenses

BETTER operating conditions on the electric railways of the United States and Çanada are indicated by the monthly reports which are being received. While some properties, particularly in the smaller communities, still show a decline in gross revenue, many increases are seen on properties all over the country. The trend toward higher gross which has been particularly noticeable in Canada for the past year or more continues, except on some of the smaller systems.

Operating expenses, on the contrary, show a reduction on many of the properties. Even where the gross busi-

Table I—Monthly Reports of Electric Railway Companies

	Operating Revenue	Operating Expenses \$	Taxes	Gross Income \$	Net Income
Key System Tr	ansit Co., C	akland, Cal.			
Dec., 1928 Dec., 1927 12 mo., Dec. 1928 12 mo., Dec. 1927	621,774 635,085 7,227,958 7,452,821	485,206 491,215 5,647,612 5,852,550	37,126 38,212 464,684 432,335	111,143 119,214 1,239,065 1,314,389	121,990 28,470 808,385 579,017
Market Street	Railway, S	an Francisco	. Cal.		
May, 1929	819,405			135,906	77,100
12 mo., May, 1929				1,380,522	646,735
Jacksonville T	raction Co.	Jacksonville	e. Fla.		
April, 1929	97.395	77 495	9 153	10,2696	
April, 1928	101,486	81,361	9,641	9,955b 114,7598	
12 mo., Mar. 1929 12 mo., Mar. 1928	1,183,310	81,361 955,396 1,054,393	106,735 108,222	114,7598 114,1738	46,707
12 mo., Mar. 1720	1,204,114	1,004,070	100,222	114,1730	51,880
Honolnin Rapi			ı, Hawall.		
April, 1929		51,783	10,616	26,278 22,119	13,054 13,315
April, 1928 4 mo., Apr. 1929	85,494 354,598	52,759 203,715	11,514 42,464	113,007	60,114
4 mo., Apr., 1928	338,083	207,840	42,375	92,062	60,971
Chlorus Conf.		. 1			
Chicago Surfa May, 1929				1 10/ 005	002.03/
May, 1929 May, 1928	5,304,553	4,157,362a 4,102,297a		1,196,885 1,202,255	902,826c 903,346c
				, , , , , , , , , , , , , , , , , , , ,	703,3100
United Railwa			,		
May, 1929 May, 1928	1,463,365	998,615	132,666	346,656	64,753
5 mo., May, 1929	1,430,428 7,022,217	958,151 4,826,449	140,134 685,703	343,945 1,580,251	61,738 161,976
5 mo., May, 1928	6,869,965	4,644,864	660,418	1,622,998	199,665
Boston Elevate	ad Ballway	Roston Ma	0.0		
April, 1929	2,916,473	1,946,699			
April, 1928	2,909,354	2,044,740	164,418		
Factory Macon	obugotta 6	tunet Dellane	Danton 1		
Eastern Massa April, 1929	716,162	427,669	32,766		100 005
April. 1928	727,390	453,255	26,955	280,222 270,917	100,085 89,171
4 mo., Apr. 1929	3,031,473	1,805,468	137,665	1,160,612	387,889
4 mo., Apr. 1928	3,188,174	1,878,548	133,869	1,254,169	414,960
Detroit Munic	ipai Railwa	y, Detroit, M	tich.		
May, 1929	2,355,752	1,894,549	62,505	407,659	272,651
May, 1928	2.067.253	1,604,558	66,965	418,505	257,140
12 mo., May, 1929 12 mo., May, 1928	26,133,685	20,751,617 18,172,257	759,288 779,021	4,815,579 4,824,245	3,065,729 2,917,134
12 mo., May, 1720	25,552,257	10,172,237	777,021	7,027,273	2,917,134
Kansas City P		ce Co., Kansa	as Clty, Mc		
May, 1929	757,768				76,578f
May, 1928 5 mo., May, 1929	783,876 3,804,758				76,874 <i>f</i> 363,301 <i>f</i>
5 mo., May, 1928	3,864,934				363,611/
International	Pallway R	ustalo N. V			
3 mo., Mar. 1929		2.283.962a		459,885	133,826
3 mo., Mar. 1928	2,804,291	2,327,658a		486,580	129,754
Fonda, Johnst April. 1929					12.023
April. 1928	82,255 94,199	61,939 64,152	7,840 7,840	13,981 24,967	17,833 6,701
4 mo., Apr. 1929 4 mo., Apr. 1928	345,804 379,561	250,936	7,840 31,360 31,360	72,455	54,388
4 mo., Apr. 1928	379,561	263,638	31,360	95,180	30,977

	Operating Revenue \$	Operating Expenses \$	Taxes	Gross Income \$	Net Income
May, 1929 May, 1928 May, 1928 11 mo., May, 1929 11 mo., May, 1928	1,015,769 1,022,716 10,563,854 10,696,238	823,769a 847,514a 9,066,845a 9,168,526a		192,000 175,202 1,497,009 1,528,712	152,464 133,836 1,048,681 1,054,723
May, 1929 May, 1929 May, 1928 11 mo., May, 1929 11 mo., May, 1928	4,298,360 4,122,595 44,418,548 43,411,307	2,649,404 2,523,788 28,515,519 27,969,142	290,064 303,302 3,091,000 3,151,368	1,427,548 1,372,975 13,726,948 13,243,040	686,447 714,858 5,914,849 5,938,321
May, 1929 May, 1928 5 mo., May, 1929 5 mo., May, 1928	1,069,375 1,046,026 5,279,986 5,251,026			543,612 506,692 2,626,334 2,284,651	206,781 171,133 946,164 906,621
Interborough May, 1929 May, 1928 11 mo., May, 192 11 mo., May, 192	6,261,572 5,917,170 9 64,009,736 8 61,886,727	3,556,701 3,405,545 38,891,861 36,121,959	192,693 233,392 2,204,008 2,992,043	2,512,177 2,278,232 22,913,866 22,772,723	645,130 <i>d</i> 477,764 <i>d</i> 3,056,661 <i>d</i> 2,949,612 <i>d</i>
New York, We April, 1929 April, 1928 4 mo., Apr. 1929 4 mo., Apr. 1928	203,585 193,028 767,041 729,196	127,360 117,361 505,413 486,688	23,350 20,120 81,655 77,506	53,558 57,039 182,707 170,537	160,516 140,963 660,234 625,141
April, 1929 April, 1928 10 mo., Apr. 1929 10mo., Apr. 1929	1,317,641 1,277,044 12,888,649 12,864,564	993,551 969,053 9,929,938 9,887,155	83,031 90,325 899,763 922,194	260,524 234,249 2,247,246 2,223,601	811 1,955 313,171 117,065
May, 1929 May, 1928	69,139 70,768	39,151 41,740		29,988e 29,028e	14,048 13,101
May, 1929 May, 1928 5 mo., May, 1929 5 mo., May, 1929	613,995 623,455 3,086 850 3,195,505	486,615 504,577 2,494,899 2,532,002	34,907 32,021 174,534 175,704	98,816 95,465 446,311 517,337	47,895 42,602 191,582 252,275
April, 1929 April, 1928 12 mo., Apr. 1929 12 mo., Apr. 1929	47,074 54,285 622,577 690,517	27,891 32,334 350,151 400,124	2,569 2,590 31,684 30,461	16,613b 19,3605 240,741b 259,931b	29,998 7,447
Feb., 1929 Feb., 1928 12 mo., Feb. 1929 12 mo., Feb. 1929	264,573 265,174 3,355,195 3,127,074	168,729 160,646 2,081,378 1,974,179	25,233 26,031 290,707 277,386	70,610b 78,496b 983,109b 875,508b	571,573 488,020
Pacific Northy March, 1929 March, 1928 12 mo., Mar. 1929 12 mo., Mar. 1928	72,952 67,395 883,769 885,842	60,404 60,201 746,647 692,589	4,366 4,221 51,456 48,005	8,180b 2,960b 85,764b 145,256b	51,629 30,286
Calgary Muni April, 1929 April, 1928 4 mo., Apr., 1929 4 mo., Apr., 1928	83,972 75,303 349,810 313,273	45,641 41,395 190,541 183,074		38,331 33,368 159,268 130,198	8,140 8,348 37,669 29,395
Edmonton Ra April, 1929 April, 1928 4 mo., Apr. 1929 4 mo., Apr. 1928	72,173 67,088 306,282 286,787	45,227 42,710 180,370 177,700		29,646 11,789 125,853 109,087	1,098 36,532 14,961 8,114
Lethbridge M March, 1929 March, 1928 3 mo., Mar. 1929 3 mo., Mar. 1928	5,155 5,299 15,949 15,701	4,278 4,236 12,357 12,942		877 . 1,063 3,592 2,759	1,708 2,238 4,164 7,144
March, 1929 March, 1928 9 mo., Mar. 1929 9 mo., Mar. 1929	1,247,795 1,178,175 10,532,764 10,164,687	795,927 820,523 7,051,875 7,163,946		451,8685 357,6525 3,480,8896 3,000,7415	
Guelph Badia 5 mo., Mar. 1929 5 mo., Mar. 1928	40,348 42,153	33,181 33,270	1,152 1,125	6,015 7,757	9,264 7,781
Ontario Hydr 5 mo., Mar. 1929 5 mo., Mar. 1928	542,290 444,836	384,144 345,759	1,946 1,998	156,200 77,078	9,321 29,635
Regina Munic April, 1929 April, 1928 4 mo., Apr. 1929 4 mo., Apr. 1928	33,947 28,472 156,048 130,675	21,492 19,409 90,623 82,780		12,455 9,063 65,426 47,896	1,012 929 19,653 7,957
Saskatoon Mi March, 1929 March, 1928 3 mo., Mar. 1929 3 mo., Mar. 1928	37,019 32,401 120,181 102,282	21,717 20,256 69,748 61,402	oon, Sask. 1,463 1,330 4,742 4,091	13,839 10,815 45,692 36,789	4,696 3,636 20,458 15,109
Italic figur s in a Includes taxe d Subject to readj	es. b Net oper	ating revenu	e. c Balauce f Before depr	for return or eciation.	investment

Table II-Condensed Financial Reports of Electric Railway Properties, 1927-1928

	North	mento ern Ry. ento, Cal.	Georgia P Raliway Atlant		Publie Se	Orleans crylce, Inc. cans, La.	& Elect Baltime	re, Md.	Public Se Kansas	is City rvice Co. a City, Mo.
Railway operating revenue Railway operating expenses	1928 \$1,477,452 1,185,104	1927 \$1,541,605 1,190,080	1928 \$5,695,086 3,891,726	1927 \$5,367,510	1928 \$7,080,679 5,030,732	1927 \$7,440,211 5,128,997	1928 \$16,273,826 10,885,708	1927 \$16,188,669 10,796,439	1928 \$9,030,316 6,903,306	1927 \$9,369,315 7,223,811
Net revenue, railway oper	\$292,348	\$351,525	\$1,803,360		\$2,049,947	\$2,311,214	\$5,388,118	\$5,392,230	\$2,127,010	\$2,145,504
Net revenue, auxiliary oper Taxes	90,570	101,619	393,871		756,954	814,405	1,579,061	1,575,938	505,530	532,790
Operating income Non-operating income	\$201,778 61,728	\$249,906 59,502	\$1,409,489		\$1,292,993 6,320	\$1,496,809 64,231	\$3,809,056 175,041	\$3,816,291 165,656	\$1,621,481	\$1,612,714
Gross income Deductions from gross income.	\$263,506 278,859	\$309,408 237,268			\$1,299,313	\$1,561,040	\$3,984,097	\$3,981,947	\$1,621,481 875,974	\$1,612,714 758,175
Net income Operating ratio, per cent	\$15,353 80.2	\$72,140 77.2	68.5		71.5	68.9	\$573,142 66.9	\$553,365 66.7	\$745,507 76.4	\$854,539 00.0
		orough ansit Co. k, N. Y.	Ry. & P	Scioto Vailey Ry. & Pwr. Co. Columbus, Ohlo		York Railways York, Pa.		iphis Railway Is, Tenn.	Houston Electric Co. Honston, Tex.	
Railway operating revenue Railway operating expenses	1928c \$67,205,294 37,712,712	1927c \$63,316,088 35,575,666	1928 \$676,891 488,941	1927 \$763,140 557,452	1928 \$2,688,423 1,510,298b	1927	1928 \$2,922,428 1,943,520b	1927 \$2,900,471 1,969,329b	1928 \$3,343,294 2,059,958	1927 \$3,069,597 1,971,540
Net revenue, railway oper	\$29,492,582	\$27,740,422	\$187,950	\$205,688					\$1,283,336	\$1,098,057
Net revenue, auxiliary oper Taxes	3,200,615	3,506,823	37,113	38,840					291,672	268,942
Operating income Non-operating oncome	\$26,291,967 29 7, 026	\$24,233,600 257,175	\$150,837	\$166,848	\$1,178,125 76,519		\$978,908 3,331	\$931,142 2,680	\$991,664	\$829,115
Gross income Deductions from gross income	\$26,588,993 21,622,777	\$24,490,775 21,540,066	\$150,837 108,875	\$166,848 97,974	\$1,254,643 530,132		\$982,239 517,551	\$933,822 513,293	\$991,664 410,701	\$829,115 384,951
Net income Operating ratio, per cent a Final revised figures. b Inc		\$4,968,769 56.2	\$41,962 72.2	\$68,874 73.4	\$724,511		\$464,688	\$420,529	\$580,963 61,6	\$444,164 64.2

ness done has increased, the expenses have gone down on some of the systems. In general this is due to greater economy in operation, since in only a few instances has the increase in revenue been due to a rise in fares.

As a result of the changes in revenues and expenses, the net revenue is higher on many of the systems. In order to save space in the tables this item is not shown, but it can be obtained by subtracting the expenses from the operating revenue. Since taxes have shown only a small change, the gross income, which is the residue after deducting taxes and adding non-operating income, is up in many instances. Out of the 31 properties for which figures are given, 25 permit a comparison of the two years. Out of these 25 the gross income for the 1929 month is higher than for the 1928 in 17 companies.

Apparently there has been an increase in fixed charges and other deductions from gross income, since in only 12 reports has there been an increase in net corporate income out of 21 companies for which comparable figures are shown.

Supplementing the annual reports published in the Journal for June, page 641, reports of ten companies are given herewith. These include final figures for the United Railways & Electric Company of Baltimore, and the Kansas City Public Service Company. The complete report of the Interborough Rapid Transit Company

What Happens When Steel Gets Tired?

Prof. D. Ewing of Purdue University will tell in an interesting article appearing in the August Issue of ELECTRIC RAILWAY JOURNAL

for the year ended June 30, 1928, which has just been released, is also abstracted. Additional reports will be published as they are received.

Striped Painting Makes Locomotive Conspicuous

By Farren Tipton San Diego Electric Railway San Diego, Cal.



Visibility of San Diego locomotive has been increased by unusual painting

AFTER the passenger cars have been pulled in for the night, freight traffic is handled over the lines of the San Diego Electric Railway. For this service a Baldwin electric locomotive is used. In order to prevent accidents, the company has painted black and white stripes on the motor car, giving it a zebra-like effect. Two series of three lamps each are mounted around the cab at intervals and connected alternately to assure illumination from all sides in case one series fails. The combination of stripes and lighting make the locomotive very conspicuous.

Midwest Association Expands Activities

Southern and central Illinois and all Iowa were taken in at St. Louis meeting. Mechanical committee formed. Papers of interest read

ENLARGEMENT of the territory of the Midwest Electric Railway Association to include southern and central Illinois and all of Iowa was voted at its convention held at the Chase Hotel in St. Louis on June 13-15. Among the more important systems that become members under this change are the East St. Louis & Suburban Railway and its affiliated companies and the Illinois Terminal Railroad. It also was voted to form a mechanical committee that will gather and disseminate data of interest to the mechanical departments of the member companies. A proposed merger of the association and the Midwest Claims Association has been deferred to determine what changes, if any, should be made in the constitution and by-laws if such a reorganization is effected.

Approximately 275 delegates attended the meeting, which in many particulars was the best ever held by the organization. The retiring president, F. G. Buffe, was highly complimented on his administration, as was the committee on arrangements, headed by B. W. Frauenthal.

Powell C. Groner, president of the Kansas City Public Service Company, in his address on "The Trend of Utility Regulation," ventured the prediction that eventually the theory of "prudent investment" will be adopted as the basis for determining the rate-base valuation of public utilities. "And I am not so sure that it wouldn't be best for us in the long run," he continued.

Still not definitely advocating the theory of "prudent investment" as the proper basis for fixing valuations, he then pointed out that it is almost impossible to obtain an up-to-date valuation on the reproduction-cost-new basis, since much time is consumed in arriving at costs, depreciation, etc., so that very often valuations are from six months to a year or more behind the date of the final decision. With the actual investment definitely known it is possible to fix a valuation for the present, he said.

Stanley Clarke, president of the St. Louis Public Service Company, who spoke on the subject, "Future of Urban Transportation in the Metropolitan Areas," would not venture a guess as to the actual future of transportation. However, he contended that in the future mass transportation will prove more and more necessary, and that if air transport comes into general use it will tend to centralize rather than decentralize metropolitan areas. This will mean more mass transportation. He expressed the belief that the street railway car is still far more economical in operation than is the bus. The cost of bus operation is 9.8 cents per passenger and would be 10.5 cents if the bus were handicapped with the same burdens of taxes, wages, etc., as is the street railway, according to Mr. Clarke.

Regarding the future treatment of street railways he said that apparently there are two schools of thought—one which seems to hold the view that the utility should be so harassed and handicapped as to make economical and profitable operation impossible, thus forcing public ownership of the utility, and the other holding that the utility should be permitted to go ahead earning a fair

return on its investment until such time as it shall no longer prove necessary to the public, when it shall be forced off the job.

Touching on the possibility of public ownership being forced through the process of starvation of the private company, he said, that the period of years necessary to bring about this change would witness great losses to investors in utilities and also to merchants, other industries and real estate values.

Eugene S. Hight, chief engineer of the Illinois Terminal Railroad System, in an address on "Building for the Future" touched on the proposed subway and elevated system his company plans to construct in St. Louis. The actual building of this \$5,000,000 project will get under way in the near future.

MEANS OF INCREASING CAR SPEED

A. J. Fink, director of transportation St. Louis Public Service Company, in his talk on "Transportation Efficiency" told how more rigid mechanical care and inspection of the St. Louis street cars has within the past year increased the number of miles each car runs before being turned in for repairs about 1,100 per cent. In June of last year pull-ins were one in every 10,342 car-miles, while in April of this year the average was one in 114,-872 car-miles, he said.

"Frequent and reliable service, speed and comfort are what the general public demands of street cars," he continued, and he then pointed out that in St. Louis the average speed of the cars had been increased from 9.87 m.p.h. in January, 1928, to 10.30 in May, 1929. This was accomplished by a tightening up of schedules, fewer stops and a campaign designed to educate motorists as to the street car's traffic rights. Prior to the installation of the designated stop plan on the University-Olive line the average speed was 10.4 m.p.h., including layover, and the present average is 11.34 m.p.h. Excluding the layover, the average terminal-to-terminal run is made at the rate of 12.13 m.p.h.

He also reviewed the results obtained during a period when parking of automobiles was prohibited on important thoroughfares in the city's downtown congested district. It was found the no-parking rule had speeded up the movement of street cars as much as 47 per cent in the district east of Twelfth Boulevard.

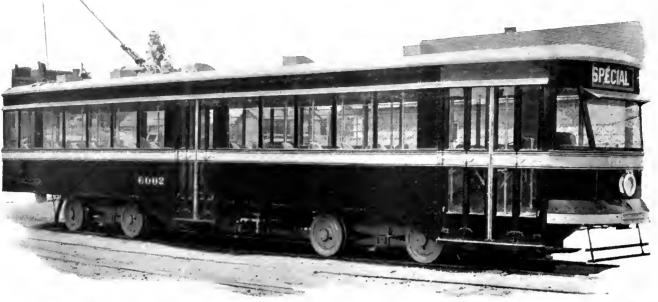
Labert St. Clair, advertising director American Electric Railway Association, spoke on the subject, "Pack Up Your Troubles." At the annual banquet, Leslie Vickers, economist of the American Electric Railway Association, was the principal speaker. Round-table conferences at which matters of mutual interest were informally discussed featured the luncheons on Wednes-

day and Thursday.

At the closing session the following officers were elected: President, R. J. Lockwood, assistant general manager St. Louis Public Service Company; first vice-president, C. A. Semrad, vice-president St. Joseph Railway, Light, Heat & Power Company; secretary-treasurer, J. A. Weimer, superintendent of transportation Kansas City, Clay County & St. Joseph Railway.

Executive committee: For two-year terms—J. N. Shannahan, Omaha; S. W. Greenland, St. Louis; E. A. Roehry, St. Louis; G. W. Welsh, East St. Louis; E. B. Meissner, St. Louis, and F. O. Grayson, St. Louis. For one-year terms—O. E. Turner, St. Louis and B. W. Stemmerich, St. Louis. Under a change in the by-laws all former presidents of the association become ex-officio members of the executive committee.

Light Weight Attained



While the new Pittsburgh car resembles those built last year it weighs 27,000 lb. as compared with 36,500 lb. for the earlier model and the exit is at the center instead of the rear

XTREMELY light in weight, equipped with electro-pneumatic control with pedal-operated accelerator and dynamic brakes, powered with four 50-hp. motors and designed to appeal to the riders, the latest experimental car of the Pittsburgh Railways, recently delivered by the Osgood-Bradley Car Company, represents another forward step in the development of modern cars to meet present-day needs. The car is in general similar to the two Pittsburgh experimental cars supplied by the same builder last year and described in detail in the June 2, 1928 issue of the Electric RAILWAY JOURNAL. The principal differences are the use of aluminum in the framing, the locating of double cross seats on one side of the rear half of the car instead of a single row of bucket seats at an angle, the substitution of a center exit door for a rear door, and modifications of the control and braking equipment. The step and floor heights, and the inside and over-all height

dimensions also have been modified.

The car was built with the lightest possible car body framing construction consistent with the necessary strength and regard for manufacturing con-All metallic siderations. parts of the body construction and the various items of equipment have been made of aluminum wherever possible. Special aluminum alloy was used throughout the structure where special strength requirements are important. while commercial aluminum was used for the various items of interior

finish such as wainscoting, cabinets, headlining, etc., where lightness only is the desirable consideration. The Aluminum Company of America manufactured the various aluminum alloy items and standard rolled sections such as I-beams, channels, tees, etc. The company also produced numerous special sections. The floor of the car is made up of aluminum Chanarch covered with Flexolith, the safety treads at the steps being of "Alumalum"

The weight of the entire body structure including the aluminum Chanarch floor plates and the complete roof with roof canvas, but exclusive of Flexolith flooring, doors, windows, window regulators, furrings, inside finish, and all items of equipment and trimmings, is 3,900 lb. The balance of 10,100 lb. entering into the weight of the complete car body is made up principally of items of miscellaneous equipment and specialties. The trucks weigh 13,000 lb., so that the car completely equipped

weighs only 27,000 lb. The trucks at present under the car are the standard Timken No. 52 trucks of steel construction. Special trucks of the same type embodying aluminum wherever possible in their construction are now heing developed by the Timken-Detroit Axle Company. With these the weight of the car will be still further reduced.

The exterior and interior of the car throughout are finished with Duco pyroxlin lacquer, a unique color scheme having been developed. The exterior of the car including side



All control equipment is encased in a cabinet ELECTRIC RAILWAY JOURNAL—Vol.73, No.16

in New Pittsburgh

Extensive use of aluminum reduces body weight of Osgood-Bradley car to 14,000 lb. Four 50-hp. motors provide rapid acceleration and high speed. Accelerator and dynamic brakes are pedal-operated

sheathing, posts, and letterboards, is in black, the space between the belt rails being Karnak green with double aluminum stripes on the upper and lower belts. A Karnak green stripe and two aluminum stripes also are located on the bottom of the letterboard. The entire roof of the car also is of green.

The interior of the car from floor to advertising card molding is in a two-tone green, the darker color being used from the floor up to and including the window sill capping. The headlining is in ivory. The floor is of green Flexolith, no paint being required.

The seats are of the special bucket type similar to those used in the two experimental cars last year and were developed by Hale & Kilburn, using aluminum in their construction wherever possible.



Bucket seats are used throughout. Behind the center door there is a double row on the left side

at each of the diagonal bucket seats and elsewhere in the car are of alloy aluminum tubing.

The window construction is similar to that used on the two previous Pittsburgh cars except that the post spacing has been reduced from 3 ft. $10\frac{1}{2}$ in. to 2 ft. 6 in., and $\frac{1}{8}$ -in. glass with aluminum frames has been used instead of $\frac{3}{16}$ -in. plate glass.

The following items of special equipment are installed in the car:

Consolidated Car Heating Company heating equipment, the

National Pneumatic door operating equipment with light-weight differential engines arranged to be interlocked with the electric control and air brake equipment.

Ohio Brass dash illuminating headlights.

Economy meters.

Ohio Brass light-weight trolley bases.

Keystone trolley catchers.

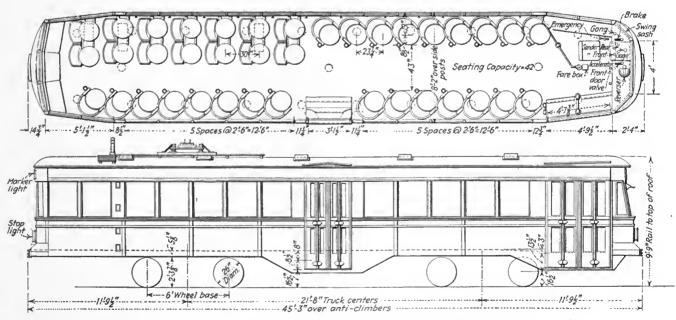
Osgood-Bradley ventilators.

Electric Service Supplies Company pull switches for signal

Electric Service Supplies Company dome lamp fixtures arranged with short-circuiting sockets for lamps, 20 in series from the main power circuit, and with dome emergency light fixtures operated through suitable relays and Philco storage battery.

Ternstedt heavy bus type window regulators.

Faraday buzzer equipment.



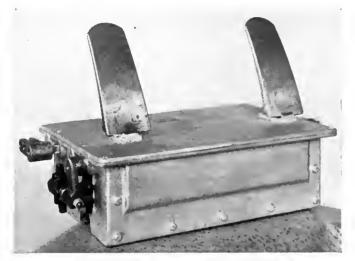
The new car is 45 ft. 3 in. long overall and 8 ft. 2 in. over side posts. With 42 sects the weight of this de luxe model is only 643 lb. per passenger

Cleveland fare box.
Nichols-Lintern sand traps.
Nichols-Lintern stop light equipment.
Pittsburgh Railways standard Hunter illuminated sign.
J. L. Howard & Company ball bearing hinges.
Osgood-Bradley life guard.

Four Westinghouse type 1426 motors, rated at 50 hp., are installed on the car. They are geared 4.4:1 to 26-in. wheels. The free running speed of the car on level

tangent track is approximately 45 m.p.h.

The control is Westinghouse electro-pneumatic, actuated with line current, with variable automatic acceleration and dynamic braking. Air brakes also are included in the equipment. The main control is through fourteen unit switches. Twelve of these are type UM and are mounted in the platform cabinet. The other two, type



This pedal control for power and brake is mounted in a recess on the cabinet

806, are mounted beneath the car. One is the line switch and the other is the main switch in the braking circuit. The use of 300-volt motors reduces the number of switches necessary, since the fields and armatures are interconnected during dynamic braking with fewer connections than would be possible with 600-volt motors. The type M resistor is mounted beneath the car. It is divided into three parts, one for the main circuit, one permanently in the braking circuit, and the third in the braking field circuit. All of the control apparatus in the cabinet was mounted on a panel and the connections were made before it was inserted in place.

The master controls, both for acceleration and braking, are foot-actuated through two pedals. They have been designed to resemble the controls of an automobile. Variable rates of acceleration and braking may be obtained, and are approximately proportional to the distance the proper pedal is depressed, the maximum being obtained with full depression. The range is between the minimum practical values and the adhesion limit. If the braking pedal is depressed as far as possible, not only is the maximum dynamic braking rate obtained, but the air brakes are applied by means of a mechanical connection with the pedal. This permits the use of the air brake should the trolley pole come off the wire and the dynamic brakes become inoperative temporarily because the emergency switch had not been set. A latch which holds the braking pedal in the fully depressed position permits the operator to leave the car with the air brakes set. If for any reason the operator should remove his feet from both pedals suddenly the power supply would be cut off and the dynamic and air brakes applied to bring the car to a stop. In ordinary service either pedal may be depressed alone and its motion arrested at any desired point. There is a holding position so that either acceleration or braking may be arrested at any point desired. In order to permit track switches to be thrown the brake pedal may be depressed past the dynamic to the air braking position while the car is drawing power.

The proper action of the control energy on the various switches is obtained by an air-operated sequence drum which gives twelve accelerating notches and eight dynamic braking notches. It also automatically applies the air brakes when the dynamic braking has reduced the car speed to approximately 3 m.p.h. To prevent any lag in dynamic braking while the motors are building up their fields, the braking connections place two of the fields across the line in series with a resistance. Since the fields and armatures are interconnected this excites the entire circuit and permits the braking action to start without any lag.

The reverser is of the drum type and is hand operated, being placed with its handle convenient to the operator. It has an emergency position in which dynamic braking will be obtained regardless of the direction of motion of the car or absence of power. This gives a quick and reliable means of stopping the car under practically any conditions. The ordinary control switch is omitted, since moving the reverser handle from either of the operating positions opens the control circuit.

The air brake equipment was specially designed by the Westinghouse Traction Brake Company to operate in

connection with the pedal electric control.

The car body is mounted on Timken-Detroit Axle Company No. 52 worm-drive trucks with disk brakes operating directly on the armature shafts. The disk brake for each motor is provided with two sets of shoes operated by special air brake cylinders mounted directly on the trucks. One set of shoes is operated by suitable mechanism through a hand lever adjacent to the motorman.

The Most Complete

Analysis of New Car Economics

Ever Published

B ACK in 1922 the management of a comparatively small interurban property comprising 70 miles of track divided into four lines, made a complete replacement of equipment with twelve light-weight cars. The following year, all of the cars on a small city system comprising 17 miles of track in a city of approximately 60,000 population were replaced with 27 light-weight one-man cars. Automobile competition has made serious inroads on the traffic of the interurban. The city system has held its own. Under these conditions the new cars on both properties have been operated long enough so that the complete record of the results is available. Was the investment in new cars justified? Look for this article by the management of these properties, in the August number of Electric Railway Journal. It presents the most interesting, complete and authoritative analysis of new car economics ever published.

New Cars

6

Pay for Themselves

on Many Properties

By

MORRIS BUCK

Engineering Editor Electric Railway Journal

Definite savings of \$1,268 in equip-

ment maintenance and power can

be made with new cars. Additional

savings are certain in maintenance

of way and in transportation. Speed-

ing up the service not only reduces

costs but makes the ride more at-

tractive and so increases revenue.

RACTICALLY every new car that has been purchased in the past few years is capable of making faster schedules than the older ones on the same property. The motors are more powerful in proportion to the weight and, taking less power from the line, the loss of voltage in the distribution system is less. Brakes are better designed. The new cars can be brought up to speed more quickly and can be stopped more quickly. Moreover, attention to design of doors, steps, and aisles has

made it possible to reduce the time for passenger interchange. Unfortunately, the roads using the new cars have not obtained the full advantage in schedules. Those which have given actual figures in the new car survey by ELECTRIC RAILWAY JOURNAL have shown increases in speed up to 6 per cent, which can be credited directly to the new equipment. Depending on conditions such as length of line, headway, number of stops and length of run in the congested section, modern cars, when segregated on definite routes, should make possible increases in schedule speed of 10 to 20 per cent above those common on the average city road. This in itself will make a material reduction in the cost of service, both in the total and on a car-mile basis. The majority of the expenses vary but little as the speed is increased, so that, the additional car mileage that can be obtained will require less investment in equipment and in the fa-

cilities needed to care for it.

As to the maintenance expenses, few properties keep separate records for the various classes of cars. Some companies that have made an accurate separation show remarkable savings in the maintenance of new cars as against the other rolling stock. The five-year average

of equipment costs in Birmingham, Ala., for new cars is 1.15 cents per car-mile less than the system average, even though the average age of all cars is fairly low. In Detroit, the Department of Street Railways shows that maintenance of new 52-seat Peter Witt cars is 1.04 cents less than for equivalent seating capacity in older doubletruck cars that they replace. Over a period of five years the Brooklyn City Railroad finds the cost of maintaining new cars is 2.5 cents less than for the old ones. Chattanooga

shows a reduction of 1 cent per car-mile as compared with the general system average. Grand Rapids has found that over a three-year period, an average reduction in maintenance cost for new cars of 2.49 cents.

From the figures analyzed in this study, it is quite conservative to state that on many properties that still

are operating heavy equipment of ancient vintage—patching, repairing and rebuilding as best they can, a saving of 2 cents per car-mile in equipment maintenance alone may be expected to result

from the purchase of new cars. Consequently, if the new equipment is used for the base schedules, operating approximately 40,000 miles per year, the saving in maintenance alone amounts to \$800 per car per year.

Replacement of a car weighing 40,000 lb. with one weighing 24,000 lb. will reduce the total load, including 40 passengers, from 46,000 lb. to 31,000 lb., or one-third. Tests made at various times have shown that the propulsion energy used is practically in proportion to weight, other things being equal. Without making allowance for higher efficiency of the new equipment,



this energy saving is reflected directly in power costs. In 1928, the average cost in the power account was 4.38 cents per car-mile for all the companies reporting to the American Electric Railway Association. Deducting 20 per cent for car heating and lighting and for shop and miscellaneous uses, the industry average cost for propulsion was 3.5 cents per car-mile. A saving of one-third of this, or in proportion to the weight alone, is 1.17 cents. For an annual mileage of 40,000 the saving is \$468 per car.

Without making allowance for other savings which are bound to come in connection with the replacement of old cars with new, the definite savings of \$800 for equipment maintenance and \$468 for power can be credited to new equipment. The total of \$1,268 represents 8.5 per cent on an investment of \$15,000 in a new car. While this is in itself sufficient to justify the replacement of an old car, no account has been taken of the ability of the new equipment to make a greater daily mileage, which will be obtainable both on account of the higher speed possible and the greater reliability and smaller shop time needed. Neither does it make any allowance for the lower transportation cost due to the higher schedule speed possible. The reduction in the number of cars which are needed to give a specified service causes a decrease in the capital invested, reducing the interest and depreciation charges, although these items do not lower the operating expense.

When the opportunities for speeding up the system, saving in track maintenance, and stimulation of riding are considered, no management can afford to overlook

the possibilities of new equipment.

Although the properties included in the survey were selected solely on the basis of the record for purchases of new cars during the past few years, without regard to location or management, it is significant that every winner of the Charles A. Coffin award since it was first offered in 1923 is included in the list. On all of these properties the financial results have been good. All but one of them, which was the winner in one of the early years of the contest, have reduced the operating ratio. The one company has been able to maintain an operating ratio between 60.5 and 64 per cent throughout the six years, or more than 12 points below the average for the country.

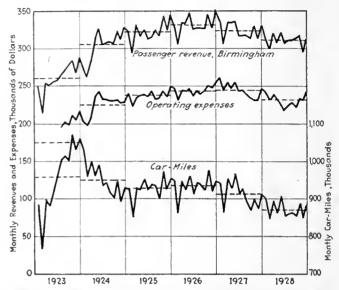
More Results from Individual Properties Show Definite Benefits

The summaries of information published in this and the preceding articles on the subject of new cars give briefly the results that have been obtained by the properties included in this survey. They all report definite benefits from the new equipment, greater or less according to the proportion of new cars and the effectiveness with which they have been placed. Numerous other properties have obtained advantages from the use of new equipment equal in magnitude, although on many of them it has not been possible to segregate the figures to show the relative revenues and expenses of the various classes of equipment.

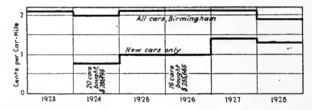
Twin City Rapid Transit Company, Minneapolis-St. Paul, Minn.—This company has built 35 cars of an entirely new design, and has modernized more than half of the 1,000 cars already on the system. There has been a good psychological effect in aiding public relationship, although it has not been possible to see any effect on the gross revenue. It is the belief of this company that good riding qualities and pleasing appear-

ance are of value, but that it is even more important to have sufficient motive power and an adequate braking system to insure a material increase in schedule speeds. This will bring substantial reduction in labor costs and the total number of cars operated, and will minimize as well the ever-present criticism by patrons of a "dragging ride"

Birmingham Electric Company, Birmingham, Ala.— This company purchased twenty cars in 1924 and sixteen more in 1926. Although a rerouting of the system in 1927 made possible a considerable reduction in system car-miles, the new cars were maintained at lower costs



Passenger revenues have held up well in Birmingham in the face of a severe industrial depression, while operating expenses have licen reduced



Maintenance costs in Birmingham have been consistently less with the new cars as compared with the average of all equipment

than other equipment. The following maintenance expenditures for bodies, trucks and electrical equipment from 1923 to 1928, inclusive, show the advantages of the new cars:

MAINTENANCE COSTS OF CAR BODIES, TRUCKS AND ELECTRICAL EQUIPMENT, BIRMINGHAM ELECTRIC COMPANY

			enus rer	Cartain	16	
			1925			
New cars			1.0			
All cars	2.1	2.0	2.1	2.1	4. 1	1.7

The maintenance cost per car-mile for the system in 1928 was reduced in part because of the influence of the materially lower cost for repairing the new cars.

Improved financial results were obtained in Birmingham despite a severe industrial depression which caused a falling off in traffic. Increased operation of one-man cars has tended to counteract an increase in wages.

Greenfield & Montague Transportation Area, Greenfield, Mass.—Under public ownership this street railway serves the communities of Greenfield, Montague City

and Turners Falls, all in the northern part of the state. Of eight cars on the property two were bought in 1927 at a cost of \$27,834. These new cars have given 65 per cent of the service on the main line since May 1, 1927. They replaced older and much heavier cars without any change in schedule speed, rates of fare or routing. In November, 1927, the flood which overwhelmed large areas in the Connecticut Valley made it necessary to co-ordinate the car service with a bus for fifteen days, which reduced the passenger revenue and increased expenses. In 1928 the discontinuance of a local freight vard caused the loss of considerable business. However, the passenger receipts in 1926 were 10.01 per cent more than in 1925, in 1927 were 8.56 per cent more, and in 1928 were 1.82 per cent more. The management cannot say that the new cars have brought any new revenue, but they may have checked a decline in revenues. patrons are very much pleased with them.

The new cars show a decided decrease in maintenance cost from the old cars. The costs of car maintenance, not including depreciation, were 4.61 cents per car-mile in 1925, 4.84 cents in 1926, 3.94 cents in 1927 and 3.27 per cent in 1928. A 6-ton difference in weights of the new cars as compared with the old cars under test showed a 15 per cent saving in energy at the car. At the substation the alternating current input was 4.45 kw.-hr. per car-mile in 1926, the last full year with the old cars and 3.97 kw.-hr. per car-mile in 1928, the first

full year with the new cars.

MODERNIZATION BRINGS GAINS IN TENNESSEE

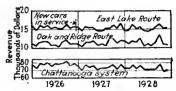
Four Tennessee properties have shown remarkable results from modernization in the past few years. These are the systems at Chattanooga, Knoxville, Memphis and Nashville. Each has purchased new cars in the past few years, although all have been consistent purchasers of equipment over a long period. In 1926 new cars were delivered in Chattanooga, Memphis, and Nashville, while the new cars were received in Knoxville in the following year. The latter property, however, had purchased 44 cars in 1923-1925. In order to make a comparison of the operating results on these four systems, the revenues and expenses have been combined for the years 1926-1928 as against 1923-1925, both inclusive. While there was a slight recession in gross revenue, amounting in the aggregate to \$582,350, or 2.7 per cent, on the four properties for a period of three years, there was a reduction of \$1,064,845, or 7.3 per cent, in operating expenses in the same period. This was accomplished despite an increase in car-miles operated of almost 7 per cent and an increase in platform wages of 2 cents per hour on all the properties. In fact, the net revenue was 0.3 cent per car-mile more in the latter period, even with the extra car mileage run. The gross

SUMMARY OF RESULTS ON	FOUR T	ENNESS	EE PR	OPERTIE	s
City	Car	Bought	Year	Total	Cost
Chattanooga. Knoxville. Memphis. Nashville.		10 12 32 10	1926 1927 1926 1926	\$146, 175, 500, 146,	000 000
A total of		64 cars		\$967,	700
Operating results: Railway operating revenue Railway operating expenses	1926-7-8	7 \$21,37	6,187	Differer \$582,350 1,064,845	less
Net revenue from railway operation	\$7,303,45	3 \$6,82	0,958	\$482,495	more
Car-miles operated	56,391,99	0 52,75	2,989	3,639,001	more
Cents per car-mile: Railway operating revenue Railway operating expenses Net revenue from railway operation	37.6 24.4 13.2	40. 27. 12.	6	2.9 3.2 0.3	less less more

saving of \$1,064,845 in three years is more than the amount spent for the cars, which was approximately \$967,700 for the four properties. While not all of the saving can be credited to the new cars, the managements are agreed that they have been a material factor in improving conditions, and that without them the saving would not have been possible.

Tennessee Electric Power Company, Chattanooga, Tenn.—In October, 1926, this company purchased ten modern cars at a cost of \$146,350. At the beginning of

1927 they were placed in service on two lines, the East Lake and the Oak and Ridge, without changes in head ways, schedule speeds, rates of fare or method of operation. While revenues in Chattanooga have fallen off in the past few years the lines with new cars showed up



Two lines in Chattanooga with new cars show better earnings than the rest of the system.

much better than the remainder of the system, as may be seen from the following comparison:

REVENUES ON CHATTANOOGA RAILWAY LINES, TENNESSEE ELECTRIC POWER COMPANY

Year	System	East Lake	Route Per	Oak and Rid	ge Route Per	Remaind Syste	
All old c	ars		Cent		Cent		Cent
1926	\$934,136	\$188,381	20.2	\$135,060	14.4	\$610,695	65.4
1927	900 571	Neu C	20.9	New C	ars	Old Co	63.8
1928	890,561 866,5 7 8		21,2	138,166		544,803	62.6

The car-miles operated on these two lines, as well as on the remainder of the system, have changed less than 1 per cent during the three-year period. The difference in revenue is, therefore, attributable almost entirely to the new cars.

Operating expenses have taken a sharp drop from \$587,757 in 1926 to \$571,165 in 1927, and again to \$558,244 in 1928. A considerable portion of this is due to the saving in maintenance expense with the new cars, which for the two years have averaged 1.22 cents per car-mile, while the costs for all cars were 3.12 cents per car-mile in 1926, 3.19 cents in 1927 and 3.25 cents in 1928. The ten cars, naturally, are not a great enough proportion of the 74 cars in daily service to make a material difference, since the cost of maintaining the old cars is increasing each year.

According to the company the new cars have stimulated riding and have improved public relations.

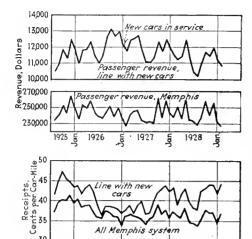
Nashville Railway & Light Company, Nashville, Tenn.

—In October, 1927, new cars of an improved type were put in service on one of the heaviest two-man lines. While there was no increase in revenue, the improved feature of the new cars as to comfort and convenience enabled the company to change to one-man operation, making a considerable saving. At the time the substitution was made the company staged a "Pageant of Street Railway Progress." More people viewed this parade than any previous event of the kind in Nashville.

The company believes that the new cars have improved

public relations materially.

Memphis Street Railway, Memphis, Tenn.—This company purchased 32 new cars in 1926 at a cost of approximately \$500,000, adding them to 199 already in service and retiring eleven, leaving 220 active cars on the system. The new cars were placed on the Peabody



One Memphis line that has been equipped

30

with new cars is doing better than the average, both in total and on a car-mile basis

1927

adjustment. Records of maintenance costs are not kept separately for the various types of cars. They were 1.66 cents in 1925, 1.55 cents in 1926, 1.61 cents in 1927 and 1.80 cents in 1928. The low cost in 1926 was due to rebuilding 40 of the older cars into one-man cars.

line in August.

revenue showed

an immediate in-

crease, which

1928, when the

revenue for the

entire system

was off, the line

with new cars

showed compar-

atively less loss.

The car mileage

has been varied

time to meet the

there has been

radical re-

but

from time

demands,

dur-

In

1926, and

continued

ing 1927.

Public relations unquestionably improved with the installation of the new equipment. There have been no franchise or fare changes during the period since the new cars have been in service, so no test has been made of their value in this respect.

LARGE SAVINGS IN MASSACHUSETTS

Springfield Street Railway, Springfield, Mass.-Fifty new cars were purchased at a cost of \$786,227 and placed in service in 1927 on four lines, with only minor changes in headways and speeds. Routing and fares have remained unaltered. The revenues on these lines held up better if anything than those for the remainder of the system during the general depression which has existed in the city during the past two years. From 1926 to 1928 there was a reduction of \$595,205 in the cost of operation. While accounts are not kept separately, the cost of maintaining equipment dropped from 4.41 cents to 3.66 cents per car-mile. Part of this reduction of 0.75 cent is due to the use of new cars for one-fifth of the total service.

The company feels that much of the improvement of public relations in the community is due to the expenditure for new equipment.

RESULTS WITH	I NEW	CARS,	SPRINGFIELD	STREET	RAILWAY
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-Annual Passenger Revenue

	System	Lines with N		Lines without	New Cars
Year	Total	Amount	Per Cent	Amount	Per Cent
1926 1927 1928	\$2,885,631* 2,585,359 2,398,270	\$607,674* 551,846 551,126		\$2,277,957 2,033,513 1,847,144	78.93 78.66 77.0
	A	nnual Car-M	Tiles		
1926 1927 1928	6,488,453* 6,064,766 5,668,353	1,184,689* 1,172,645 1,195,410	18.26 19.33 21.08	5,303,764 4,892,121 4,472,943	81.74 80.67 78.92
	C	ents per Car-	Mile		
1926 1927 1928	44.7* 42.7 42.2	51.21* 47.07 46.10		42.94 41.57 41.29	
	Syster	n Operating l	Expenses		
1926	\$2,475,889*				
1927 1928	2,190,511 1,880,684				
*Before new ear	rs were install	ed.			

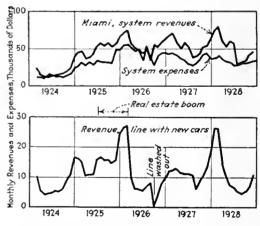
Worcester Consolidated Street Railway, Worcester, Mass.—As in Springfield, 50 cars were bought in 1927 at a cost of \$787,679 and placed on four routes. Schedules were unchanged. The revenue has remained practically constant, having a reduction in 1928 of 5.6 per cent from 1926, whereas the lines without new equipment have dropped off 17.1 per cent, or more than three times as much. While costs are not segregated, there has been a reduction of \$816,913 in the total from 1926 to 1928. Equipment costs have gone down from 5.75 cents per car-mile to 3.75 cents in the two years with the modern equipment, making about 22 per cent of the total. As in Springfield, the new cars, representing a very vital part of the rehabilitation program which the company is putting through, have improved public relations.

RESULTS WITH NEW CARS, WORCESTER CONSOLIDATED STREET

	Annus	al Passenger l	Revenue		
Year	System Total	Lines with N Amount	lew Cars Per Cent	Lines without Amount	New Care Per Cent
1926 1927 1928	\$2,922,099* 2,685,857 2,512,280	\$781,651* 763,476 737,944		\$2,140,448 1,922,381 1,774,336	73.26 71.58 70.63
	A	nnual Car-M	iles		
1926 1927 1928	6,072,892* 5,446,097 4,953,359	1,300,754* 1,282,179 1,282,500	21.42 23.54 25.89	4,772,138 4,163,918 3,670,859	78.68 76.46 74.11
	C	ents per Car-	Mile		
1926 1927 1928	48.11* 49.31 50.72	60.09* 59.54 57.54		44.86 46.17 48.34	• • • • •
	Syater	n Operating l	Expenses		
1926 1927	\$2,729,220* 2,353,880 1,912,307		• • • • •		• • • • •

*Before new cars were installed.

Miami Beach Railway, Miami Beach, Fla.-This property has been affected in the last few years by the land boom in the city. The great increase in business in the winter of 1925-1926 prompted the purchase of twelve new cars, which were placed on one route. In addition twenty new cars were taken over from the Coral Gables Corporation.



In Miami, Fla., one route with new cars is doing as well now as it did during the real-estate boom in 1925-1926

The new cars began service in January, 1926. The revenues went up immediately from \$16,900 in December to \$24,600 in January, with further increases in February and March. With the collapse of the boom the riding fell off sharply. There was a further setback in October, 1926, when the hurricane washed the line off the causeway into Biscayne Bay. Hence the receipts for October and November were far below normal.

order to handle the traffic the line was double-tracked in July, 1927, and the headway was changed from ten and twenty minutes to five and ten minutes, the schedule speed being increased from 9.8 to 16.6 m.p.h.

The cost of car maintenance in 1924 and 1925 was 2 cents per car-mile. In 1926, when it was necessary to use all available equipment on account of the boom, and when repairs were abnormal as a result of the hurricane, the cost went up to 4.1 cents. In 1927, however, it fell to 2.6 cents and in 1928 remained at 2.8 cents. The new cars, of course, are of greater capacity than many of the single-truck cars in former use on the property.

Public relations have improved on the whole as the new cars are large and roomy, with ample motor equipment. The new cars have been so popular that the patrons of some of the other lines on which there is less

riding have requested the new type cars.

Wheeling Traction Company, Wheeling, W. Va.— This road purchased a total of 23 new cars in 1924, at a cost of \$322,432. These have been in service ever since, carrying about one-third of the total traffic. There has been a marked improvement in public relations, notably evidenced by the passage of many better new franchises. The progressive attitude of the management in the rehabilitation of the property has been largely re-

sponsible for this result.

Wheeling Public Service Company, Wheeling, W. Va. -Fifteen new cars were placed in service on this system in January, 1927. For approximately six months the gross revenue showed an increase of 2.5 per cent. Afterward, owing to industrial conditions, the revenue fell off and is not yet up to normal. The new cars were designed for one-man service, making a saving of about 30 per cent in conducting transportation. The maintenance of equipment cost compared with that of cars which had been in service for fifteen to twenty years is estimated by the management at about 25 per cent less. Taken as a whole, the costs for the year show a decrease of about 27 per cent. Not all of this can be attributed to the new cars, as considerable construction work in the way and structures department is now resulting in a saving.

The public relations have improved with the new equipment. It is possible to give better service with fewer delays, and this naturally creates a better feeling

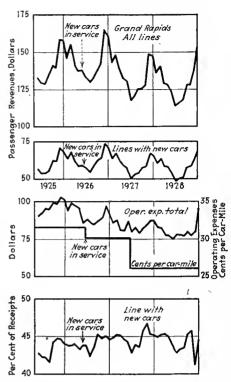
on the part of the riding public.

Brooklyn City Railroad, Brooklyn, N. Y.—New cars have permitted this company to speed up its schedules on all lines where they have been installed, reducing the duration of the stop from an average of 8.2 seconds to an average of 6 seconds, and have done their part in reducing accidents of all kinds. On lines where other conditions such as the opening of subways have not complicated the situation they have materially reduced the cost of maintenance. Over a period of approximately five years this reduction has been 2.5 cents per car-mile.

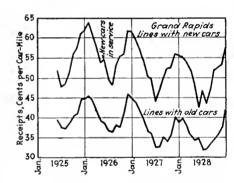
Revision of some surface lines on account of the opening of new subway routes and the addition of express service to others has resulted in a reduction in gross revenue. The net, however, has been about the same since the installation of the new cars, despite the increases of wages of trainmen and shopmen. The economies are attributed to the new cars. In the opinion of the management they have had a great deal to do with creating more favorable relations, both with the public and with the employees. On the whole there is no question but that their purchase has been a wise investment.

Grand Rapids Railroad, Grand Rapids, Mich.-Fol-

lowing the experimental installation of three cars in 1925 in an effort to determine what features were of greatest benefit, this company bought 27 new cars in 1926 at a cost of \$359,544. These cars were placed in service on two lines. There were no material changes in headways, speed, fare or routing, although two-man operation was replaced by oneman operation. The immediate effect of the new cars was an increase of revenue as compared with the year before. For the first twelve months the lines with the new cars showed an increase of \$15.-448, while the lines using the old cars showed decrease of \$15,956. The new cars thus were able to keep the system revenue practi-



Two Grand Rapids lines with new cars are bringing in a higher proportion of the gross revenue than they did in the old days, while the operating expenses, both total and in cents per car-mile, are much less. Receipts per car-mile are shown below in comparison with the rest of the system



cally up to the level of the year before, although they only produced 36.8 per cent of the car-miles. Although in the last two years revenue has fallen off, principally on

RESULTS	WITH	NEW	CARS,	GRAND	RAPIDS	RAILROAD
		13.0	fore			

New Cars	——After 1n	stallation of	New Cars—
June-May	June-May	June-May	June-January
1925-1926	1926-1927	1927-1928	1928-1929*
Passenger receipts: Routes with new cars Routes without new cars 967,215	\$758,865	\$709,426	\$453,857
	951,261	873,428	569,403
Sys' m total \$1,710,633	\$1,710,126	\$1,582,854	\$1,023,260
Per ee nt of total receipts, routes with new ears 43.3	44.3	44.9	44.3
Car-miles run: Routes with new cars 1,327,147 Routes without new cars 2,350,385	1,373,577	1,378,239	916,270
	2,373,454	2,415,452	1,613,066
System total 3,677,532	3,747,031	3,793,691	2,529,336
Per cent of car-miles, routes with new cars 36.1	36.8	36.4	36.2
Earnings, cents per car-mile: Routes with new cars System average 46.6	55.1	51.4	49.5
	40.2	36.2	35.1
	45.7	41.7	40.5
Operating expenses: Total	\$1,048,740	\$986,430	\$663,406
	30.2	26.1	26.1

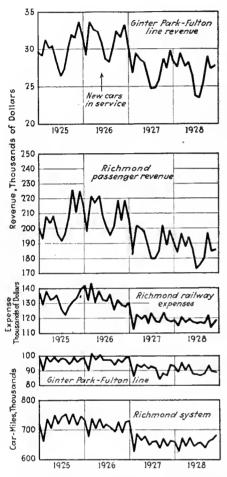
^{*}Eight months only.

account of unfavorable industrial conditions in the city, the management contends the decrease would have been even greater had it not been for the modern equipment.

Maintenance costs of the new cars have been very low, as may be seen from the following table:

ANNUAL COSTS OF CAR MAINTENANCE IN GRAND RAPIDS

	-Cents Per Car-Mile-
	New Cars All Cars
1925	
1926	0.00
1928	



The Ginter Park-Fulton lines in Richmond, Va., with its new cars, has done much better than the average of the system in revenue. The expenses of the system have been reduced sharply in the past two years

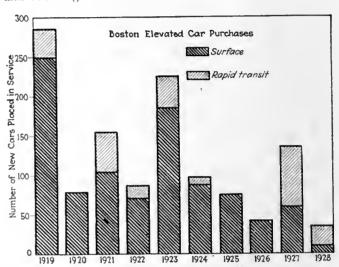
than for the system as a whole. While the head-ways, routing and fares have remained substantially the same there has been a slight saving in car-miles during 1928 on the line. There also has been an increase in speed, from 9.21 m.p.h. to 9.31 m.p.h. While exact data are not available for maintenance cost on the new equipment the company estimates a saving of 1 cent per carmile with the light-weight double-truck cars as compared with heavy equipment. The total car maintenance for the system has been reduced year by year as follows: In 1925 it was 4.47 cents, in 1926, 4.12 cents, in 1927, 4.0 cents and in 1928, 3.87 cents.

The new cars have been of considerable value in fostering good public relations in that section of the city served by them.

Virginia Electric & Power Company, Richmond, Va. - In June, 1926, fifteen new cars were purchased at an approximate cost of \$216,000 a n d placed in service the Ginter Park - Fulton line. It is rather difficult to determine the effect of the cars on revenues, since there was rather complete rerouting and co-ordination of rail and bus service in 1927. January, line was paralleled for approximately 0.9 mile by a bus line which was started in January, 1927. This took away considerable revenue.

The earnings on this line have held up proportionately higher Arkansas Power & Light Company, Little Rock.—Thirty new one-man cars were purchased in 1926 as part of a modernization program. Immediately afterward the company changed over all of its cars for one-man service. It was found possible not only to hold the schedule speed, but to increase it slightly with the advent of the one-man service, while the accidents were reduced materially.

Boston Elevated Railway, Boston, Mass.—There is no comparison between the modern equipment on this system today and that in 1918. During the past ten years this company has spent \$19,000,000 for new cars and buses. In this time there have been placed in service 906 new surface cars of modern type, 165 steel elevated and tunnel cars, 95 Cambridge Subway-Dorchester Tunnel cars, 48 East Boston Tunnel cars and about 300 buses. The company has retired 1,476 out-of-date cars, and 72 of the new cars have been sold or destroyed by fire. With fewer cars in service, the number of seats furnished has been increased due to the larger capacity of the modern cars and to more frequent headways, in part made possible by the use of one-man cars. The new cars have wider doors and lower steps, thus serving convenience and reducing accidents.



Consistent purchases of cars, both for surface and for rapid promit lines, have marked the program of the Boston Elevated Railway during the past ten years

Of course the substitution of modern cars for old has resulted in substantial economies. Their use is, however, only one of many changes made during the ten-year period, and it is not possible to allocate economies in dollars to the modern equipment.

Purchases of new cars by years are shown in the

accompanying diagram. A consistent program has called for additions every year. With the adoption of public control an adequate depreciation fund has been set aside, amounting to between \$2,000,000 and \$3,000,000 per year. This makes it possible to provide for future re-

BOSTON ELEVATED	RAII	JWAY
Per	Cent	of Total
Modern cars	7.1	49.4
Semi-modern cars	19.4 46.2	10.1
Rapid transit	25.0	29.1
Foreign cars	2.3	1.0 10.4
Duses		10.1

SERVICE WITH VARIOUS

EQUIPMENT, 1918 AND 1928,

newals. An accompanying table shows how the new cars have been put to good use. The box cars, articulated and earlier types of semi-convertible cars which previously made up the surface rolling stock have virtually been retired except for emergency duty.

Pacific Electric Expands

Pick-UpandDeliveryService

Co-ordinated rail and truck freight service, established by means of contract arrangement with independent truckmen, meets demands in satisfactory manner



Independent truck owners are glad to accept contracts with Pacific Electric Motor Transport Company

O GIVE better service to the shipper and at the same time meet the inroads of motor truck competition, the Pacific Electric Railway, through a separately

organized and operated subsidiary, the Pacific Electric Motor Transport Company, last March inaugurated a store door, freight pick-up and delivery service. The Transport Company publishes rates from store door at point of origin to store door at point of destination. It issues a single through billing from and to both points and undertakes the performance of the entire service. At originating points the Transport Company's trucks pick

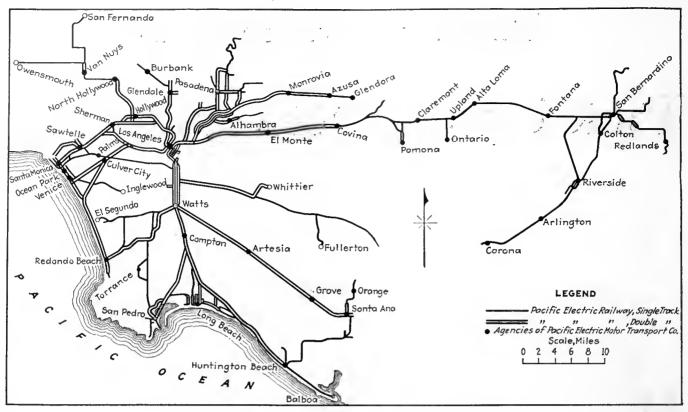
By

PAUL T. PORTER

Editor Bureau of News, Pacific Electric Railway Los Angeles, Cal. up shipments at the merchant's store door and haul them to the station where they are loaded on cars of the Pacific Electric Railway and hauled by rail to the station of destination. At

such destination station the shipments are transferred again from the rail cars to the motor trucks and delivery is made to the store door of the consignee.

In addition to store-door to store-door delivery, the tariff of the Transport Company in some instances includes rates from or to the station; that is, from the station at originating point to store door at point of destination; or from store door at point of origin to



Map of territory served by Pacific Electric Motor Transport Company

station at point of destination. The object of these alternative rates is to enable the Transport Company to render service similar to that supplied by private truck carriers. In no instance does the Transport Company publish station-to-station rates. The contract of the latter company with the Pacific Electric Railway provides for the new company to make joint use of the railway's freight stations and station employees, the Transport Company participating in payment of salaries to such employees and paying rent for the use of facilities employed.

A combination waybill and expense bill is used, the complete document being made out by the agent at the forwarding point. An outstanding advantage of this practice is that the expense bill is ready to go with the truck driver who makes delivery at door of consignee. The plan of operation also provides a .c.o.d. service for the shipper, the truck driver making the collection. In the case of regular customers, whose financial status is unquestioned, the Transport Company's agent makes collection for services rendered.

In recognition of the fact that the C.O.D. shipper is pleased with the quick return of collections for merchandise so shipped, the Transport Company management conceived and perfected a plan whereby such collections are paid over to the shipper within from 24 to 36 hours after pick-up of the shipment. This feature of the service has been commended most highly by many of the shippers.

Use of the rail car for the line haul between origin and destination points is simply an operating convenience, and so far as the shipper and receiver are concerned, the railroad does not enter into the performance of the service contract. The rail service is carried out by the railroad for the Transport Company under a private contract. Under the plan of operation now in effect the Pacific Electric Motor Transport Company has not found it expedient to purchase its own motor trucks.

contracts to date having been made with local truck operators within the towns or districts being served. Sensing the possibilities for increased business, truck operators have been quick to enter into contracts. The large tonnage which promises to develop has also been an incentive to truck owners to seek a contract arrangement with the new company. Rates of the new company are not gaged or based upon existing rail rates between the same points. Necessarily, they are designed to meet on common ground motor truck carriers operating in the same territory, and while the Transport Company's rates are in some instances the same as station-to-station rail rates, in most cases they are higher.

The large number of freight trains operated by the Pacific Electric Railway makes possible a one-day delivery. Shippers are urged to notify of pick-up not later than 3 p.m. and when this is done guarantee of delivery is made for early the following morning. Failure to notify of pick-up by 3 p.m. does not necessarily imply that a truck will not call the same afternoon and accomplish delivery the next morning, and arrangements have been made whereby shipments, picked up as late as 5:30 p.m., have been delivered early the following morning. Many shippers find it necessary to keep their floor space clear and insist that shipments be taken as soon as they are ready. To meet this condition contracts with truck operators stipulate that they shall make pick-up within two hours after being notified to call.

Operators of the truck fleets have shown both a willingness and even desire to obtain contracts in the various cities where the pick-up and delivery service has been put into operation. For the most part they look upon a tie-up with the new Transport Company as a medium for increasing their tonnage and providing business that will permit the maximum use of their equipment. In not a single instance to date has a truck owner abrogated his contract. What effect the new concern will have upon long-distance hauling has not yet

been determined, but the truck fleet owners evidently feel no alarm, due to the fact that much of their business is of a character that cannot be duplicated or performed

by the Transport Company.

The ultimate success of the undertaking cannot be gaged until the operation shall have been continued for a number of months. However, since the service was inaugurated on March 11, each month has witnessed a gratifying increase in the tonnage handled, and the Transport Company's management has expressed itself as being enthusiastic over the reception accorded the service of the new organization.

While tonnage increases have not been made public, evidence that the service has met a receptive welcome among shippers is reflected in the fact that on June 1 twenty additional southern California cities were added to the original list of 24—there now being 44 cities within a 70-mile radius from Los Angeles to which the service is available. The business already being handled is said to compare favorably with many of the larger transportation agencies which have been in business for many years. It is also stated that in the short time since the service was begun 245 industries have been served, of which 210 were not previously users of the rail service of the Pacific Electric Railway. It is estimated that a business of 500,000 tons per year will be developed.

The service was inaugurated without any special advertising nor were additional solicitors put out to introduce it. Freight solicitors of the railway are lending their assistance during the routine of their calls upon industrial firms, and agents in many of the cities aided to some extent in acquainting the shippers of the districts with the new type of service.

Canadian Association Celebrates Silver Anniversary

Program of Montreal convention reflects progress in the dominion's transportation and growth of electric railway service

ONTREAL, the scene of the formation of the Canadian Electric Railway Association 25 years ago, witnessed the 25th anniversary convention held June 4-7. The meetings were held in the newly-completed stadium, while most of the social events took place at the Windsor Hotel. In the absence of the president, D. W. Harvey, the meetings were presided over by Vice-President C. H. Dahl.

The annual address of Mr. Harvey, read by the secretary, pointed out the growth of the electric railway business in Canada in the 25 years during which the association has been in existence. That this growth is continuing is shown, according to the speaker, by the increase in gross revenues of the member companies of \$3,000,000 in 1928 as compared with 1927. Further, there were no abandonments of city service last year. Faith in the future growth and development of the electric railway, he said, has been shown during the year in cases where suburban single-track lines have been changed to double-track. There has been a steady increase in route-miles operated by the Canadian companies by the extension of permanent track and motor bus routes. Nevertheless, the speaker feels that the companies must be at least one step ahead of any conditions which might adversely affect the upward trend in the matter of revenue passengers carried. The plants—the only ones of their kind in each community—are surely adapted to earn revenues other than those from carrying passengers. An increase in the profitable use of the transportation plant will make it possible to produce better transportation.

Four committees presented reports. These covered motor buses and trucks, rail corrugation, publicity and merchandising of transportation, and safety and accident prevention. The committee on rail corrugation recommended that an intermediate manganese alloy, preferably sorbitized, offers the most hopeful solution from the standpoint of the rail. In the discussion it was pointed out that this recommendation, made independently, confirms that of the similar committee of the International Association.

New sources of revenue and further uses of equipment were investigated by the motor bus and truck committee. It was stated that the most outstanding ways of getting more business are interline operation, night operation of coaches, and package express. It was pointed out that the latter business can be handled on early and late trips when the passenger load is light, so that the service is interfered with but little.

Two formal papers were read during the meetings. The first was on the subject of developments in track design, construction and maintenance, by A. T. Spencer, general superintendent construction and maintenance, Montreal Tramways, and O. C. Rehfuss, chief engineer Canadian Steel Foundries. Experience with various types of track structure, both in Montreal and elsewhere, was given. In the discussion which followed considerable difference of opinion developed as to the merits of various kinds of ties. Experience in thermit welding of joints under traffic was given by E. M. T. Ryder of the Third Avenue Railway, New York City. A method has been developed in which a maximum of three minutes is needed for pouring the weld. Others said that pre-cast rail filler has been valuable in reducing noise, but that in some instances it has had a tendency to break down and leave an opening alongside the rail.

THREE DISTINCT CLASSES OF TRANSPORT

R. N. Graham, manager of railways Penn-Ohio System, Youngstown, Ohio, read a paper on the relation of urban transportation to suburban and interurban traffic. In a territory with a central city surrounded with suburban communities and smaller cities with independent business and trade activities three classes of transportation must be given. While the cities themselves are vitally dependent on mass transportation, and in them the effect of the private automobile is least, it is a more serious factor in suburban transportation and is most serious of all in its effect on interurban traffic, according to the speaker. The urban resident saves the least in time and money with his automobile. The suburban resident saves more in car fare to offset the high price of running

his automobile, and the interurban passenger can so time his infrequent shopping and entertainment trips as to use his automobile to the best advantage. As a direct result the greatest mileage of abandoned street railway lines is in the interurban classification.

Suburban lines should not be cut off at the end of the city system, said Mr. Graham, but the cars should be run through to the center. The city cars should be speeded up so that the suburban cars will not be delayed unduly, and the headways should be so chosen that the suburban cars, making infrequent stops, can gain the space between city cars. Loading platforms, shelters and illumination all help to popularize the service. If one-man cars are used, signals, switches and fare collection should all be designed to require a minimum of time on the part of the operator. Buses have been found useful in suburban transportation, and the speaker held that their use is not an alternative but is supplementary. Buses can be run express through city streets and so can make superior speeds. Since buses cannot be operated economically on long lines at a flat rate of fare, the suburban bus must charge a higher fare, not as an equivalent service to the street car but as a supplementary service. Interurban service is not supported by regular, every-day riders, being merely a convenience to the casual rider. Nothing can be gained by commutation fares or other reduced rates. Fares must depend on mileage, and so the bus, from the standpoint of riding capacity, is as fitted to produce a profit as the street car.

A feature of the Canadian Association's meetings is the discussion of "Timely Topics." Much interest developed on the subject of follow-up training and grading of car men. D. E. Blair, Montreal, brought out that the early training of the man is likely to crop out in after years, so that a close follow-up is needed. Since some men are more prone to accidents than others, they should he watched and have their occupations changed if necessary.

Records of the Montreal Tramways show that a relatively small proportion of the men have a large share of the accidents. H. O. Allison, Pittsburgh, Pa., corroborated this statement. He has found many men of ten to twenty years' service who have needed reinstruction.

On the subject of systematic maintenance of rolling stock, A. M. Lindsay, Montreal, pointed out that adequate records, standardized methods and practices, regular inspection and periodic overhaul are all needed to prevent failures. W. R. McRae, Toronto, feels that it should be unnecessary to point out the need for systematic maintenance when there is no argument whatever to be made against it.

INCREASE OF SCHEDULE SPEED HELD A VITAL NEED

G. E. Waller, Hamilton, and W. F. Irvin, Toronto, discussed ways and means for increasing schedule speed. It was pointed out that many factors are within the control of the company, such as the track, cars and power. Other conditions that are beyond the direct control of the company are traffic, parking, etc. The principal means of improving schedule speed are increases in rate of acceleration and braking, reduction of time of passenger interchange, elimination of stops, installation of electric switches, substitution of loops for wyes, etc. In Toronto the standard spacing of stopping places is now six per mile in the residential areas and seven per mile in the business districts. The public is becoming appreciative of the improvement in schedules afforded by the changes.

Installation of automatic synchronized signals caused a reduction of 10 per cent in speed from the manual system. Replacement of this with the co-ordinated system caused an increase of 9 per cent in speed, but did not bring it back to what it was with the manual system. Long signal cycles have been found very bad, causing added congestion and reducing the speed.

TROLLEY MAINTENANCE SAVES DELAYS

Preventing delays to traffic by the use of modern methods in the overhead department were discussed by G. H. Cartwright, Quebec, and J. F. Neild, Toronto. According to Mr. Neild, the control of the system comes down to the keeping of accurate records. The location of wire is important. Use of a plumb-bob has not been sufficient, since there are sections of track where the rails are not parallel horizontally. A better method is to inspect the side wear on the wire and adjust the position to equalize this. It was considered better to remove trolley wire with a reduction of 35 per cent in area in congested districts rather than to risk breaks, as the cost due to loss of service may easily outweigh the value of the

W. E. Massie, St. Catharines, and W. R. Robertson, Toronto, spoke of the comparison between cost of steel and cast-iron car wheels. In Canada the cost, including all factors, does not differ greatly. Experiments on a one-wear heat-treated rolled-steel car wheel on the Niagara, St. Catharines & Toronto Railway, have proved satisfactory. It is expected to get 100,000 miles with one wear at a cost comparable with that of the other types of wheel.

As is customary, three formal luncheons were held on the three days of the convention. The first was devoted to short talks by those of the founders who were able to be present. They included J. E. Hutcheson, Acton Burrows, E. A. Evans, R. M. Hannaford and D. E. Blair. The second day the audience was addressed by Leslie Vickers, economist of the American Electric Railway Association, who discussed trends in local transportation. On the third day the address was by J. F. Saint-Cyr, chairman of the Montreal Tramways Commission.

Officers were elected at the closing meeting to serve for the ensuing year, as follows:

Honorary president, J. F. Saint-Cyr, chairman Montreal Tramways Commission.

Honorary vice-president, Acton Burrows, president Acton Burrows, Ltd., Toronto.

Honorary advisory council, Hon. T. Ahearn, Ottawa; Edward Anderson, Winnipeg; Lt.-Col. J. E. Hutcheson, Montreal; C. A. Magrath, Ontario; W. G. Murrin, Vancouver; J. C. Smith, Montreal.

President, C. H. Dahl, assistant general manager Winnipeg Electric Company.

Vice-president, G. E. Waller, vice-president Dominion Power & Transmission Company, Ltd., Hamilton.

Treasurer, H. C. Patton, comptroller Toronto Transportation Commission, Toronto.

Auditor, J. E. Richards, manager and treasurer London & Port

Auditor, J. E. Richards, manager and treasurer London & Fort Stanley Railway, London, Ont.

Executive committee: The president, the vice-president, the treasurer, the immediate past-president (D. W. Harvey, Toronto), and D. E. Blair, Montreal; T. W. Brackinreid, Port Arthur; F. D. Burpee, Ottawa; W. S. Hart, Three Rivers; D. W. Houston, Regina; W. B. Powell, Montreal; W. R. Robertson, Toronto; L. Tait, London; K. B. Thornton, Montreal, and H. E. Weyman, Levis

In connection with the convention an exhibit of electric railway materials and supplies was held. The leading manufacturers of this class of equipment in Canada were represented, as were several of the principal American bus builders. The Montreal Tramways also showed typical examples of its latest rolling stock.

Vision of Local Business Men

Puts Oklahoma Railway on

PAYING BASIS



MERGING from its financial difficulties, the Oklahoma Railway is now able to meet all fixed charges and earn a small net revenue. During the past three years there has been a steady increase in patronage and it appears that the company has successfully passed through the period of depression which has been generally felt by electric railways throughout the country. The company was

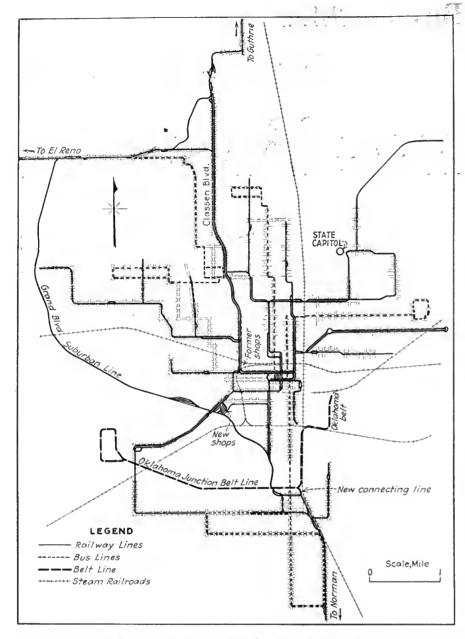
first organized in 1903 as the Metropolitan Railway, with only 6 miles of track. Today it has more than 150 miles of track and is the largest electric railway in Oklahoma. Since 1926 the number of passengers carried on its lines has increased 25 per cent. Although the company has steadily increased the number of buses in service, the proportionate increase in the number of street car passengers has been more rapid than in the number of bus passengers. In 1926 bus passengers constituted 25.4 per cent of the total traffic, while last year the bus passengers were only 24.4 per cent of the total.

Improvements costing \$2,000,000 have been made during the past three years. New equipment has been purchased and new carhouse and shops built. Number of passengers carried has increased 25 per cent. Facilities for freight handling have been greatly improved

These results have been achieved under the management of Oklahoma City business men. In 1927 the Oklahoma Railway was purchased by Hubert R. Hudson and his associates, William Mee, banker; Dr. G. A. Nichols, real estate man; T. C. Thatcher, miller; A. E. Monroney, merchant and A. O. Campbell, contractor and builder. Prior to that the company had been in the hands of receivers for about three

years. The new owners have expended nearly \$2,000,000 in the purchase of new cars and buses, making extensions to city lines, enlarging and remodeling the terminal station and building a new carhouse and shops.

The latest step in the company's program of equipment improvement was the purchase early in the present year of six new buses and ten new street cars for city service. The cars are being built by the St. Louis Car Company at a cost of \$110,000. They are double-truck, four-motor, one-man cars with a seating capacity of 36 and weight of 24,000 lb.



Oklahoma City is served by some 75 miles of street railway track, besides the new Grand Boulevard electric freight line, the recently electrified belt lines and numerous motor bus routes

During 1928 the company remodeled its downtown terminal station at an expenditure of approximately \$25,000. The roof of the station was extended, a number of ticket and concession stands constructed, additional entrances and exits provided and other minor improvements made to permit more rapid handling of car and bus traffic. This station has been a feature of the company's service for many years. A majority of the 125 street cars and 40 buses operated by the company are routed through the terminal, which is located in the business center of the city. During the early days of the receivership an effort was made to partially dispense with the terminal by through routing certain cars. This was done in the hope of speeding up crosstown service and eliminating as far as possible transfer of passengers. The plan was later abandoned and the terminal station is again being used as before.

Approximately \$250,000 has been spent on new carhouses and shops located in the southwestern part of the city. These stand on property which once was the most widely patronized amusement park in Oklahoma City. The buildings consist of a main structure, including paint shop, carpenter shop and garage. The old location of its shops near the center of the city, will be made available for industrial sites.

The new owners recently abandoned the operation of the railway power station at Belle Isle on the Guthrie-Oklahoma City interurban line just north of Oklahoma City. This plant has been owned and operated by the company for many years, together with high-voltage lines extending to the towns of Yukon, Cashion and Edmond. The Belle Isle property also included 90 acres of lakes and small streams which for nearly three decades served as one of Oklahoma's chief playgrounds. This land, including the site of the amusement park, the lakes and streams, the generating plant and the high-tension lines, was sold recently to the Oklahoma Gas & Electric Company.

FREIGHT BRINGS ADDED REVENUE

Under the receivership various steps had been taken to cut operating expenses and increase revenue. The new owners realized, however, that a large amount of additional business must be created in order really to put the property on a paying basis. The most promising means of securing the necessary additional revenue was thought to be by expansion of freight business. The company owns and operates interurban lines centering in Oklahoma City, extending to Norman, El Reno and Guthrie and intermediate points over which passengers, express and freight have been carried for years. These three lines, constituting a total of about 85 miles of track and radiating to the

southward, westward and northward, respectively, are connected with the city transportation system, which includes about 75 miles of track.

Shortly after the Hudson interests took over the property a plan was devised for increasing freight revenues by constructing a freight line around the northwestern, western and southwestern suburbs to tie together the three interurban lines and enable the company to carry freight more rapidly and with less interference to and from city traffic than was possible with existing facilities. At that time all freight originating on or consigned to the three interurban lines was being carried over the Classen Boulevard city line, which also served for carrying city and interurban passenger traffic. Boulevard is one of the main outlets from the business district to the northern environs of the city, and for most of its length is lined with fine residences. One of the reasons for building the new line was the opposition of a number of Classen Boulevard property owners to the operation of freight trains through this district.

PASSENGERS CARRIED BY YEARS

	Nu	mber of Passeng	ers ———
Year	Street Car	Bus	Total
1926. 1927.	14,682,000	3,300,000 3,900,000	16,300,000 18,582,000
1928,	16,424,000	4,000,000	20,424,000

Many difficulties were encountered in negotiating an agreement satisfactory to the City Council, Classen Boulevard residents and to the company. Several months expired before a final agreement was reached in March, 1928, providing for construction of the new Grand Boulevard line. Officials of the railway, however, showed their good faith by beginning construction before this agreement was finally signed, and in rushing the work to early completion with a large force of men as soon as all difficulties were out of the way. This line was completed and put into operation in December of last year, at a cost of approximately \$1,250,000, including relocation and construction of new shops, terminal yards, switching facilities, and purchase of new equipment.

For several reasons the Grand Boulevard line was located for the most part outside of Oklahoma City. The company desired to locate the line where it would not interfere with future growth of the city, and also where land values were relatively low and industrial sites and switching facilities could be acquired at reasonable prices by individuals, firms and corporations. While the company is not sponsoring any industrial real estate developments along this line, it is encouraging the sale of manufacturing and other industrial sites.

BELT LINES LEASED AND ELECTRIFIED

About a year ago the new owners secured a ten-year lease on the Oklahoma Belt Line Railway, approximately 5 miles in length, at that time steam operated and connected to the principal trunk line railroads entering Oklahoma City. This belt line connects with the Oklahoma Junction Railway, which has about 5 miles of switching and side tracks in the packing-house district. The Oklahoma Railway acquired a 99-year lease on this property also. The principal reason for acquiring these roads was to secure freight terminal facilities to handle business from the packing-house district and also other business originating on or consigned to steam railroads connecting with the belt lines. Oklahoma City has an extensive packing-house industry and stock yard facilities, and a great deal of business is handled to and from the packinghouse district. The volume of traffic resulting from acquiring the belt lines and constructing the new freight line is steadily increasing, and the management believes



Right-of-way of the new Grand Boulevard freight line which partially encircles the city through its outskirts

that these various acquisitions will prove to be a profitable investment.

In addition to the packing-house business, the Oklahoma Railway handles much freight and express traffic of many kinds that originates at points along the interurban lines. The company also serves several sand pits which have a large output, located northwest of the city near its El Reno and Grand Boulevard lines.

In addition to the connections between the two belt lines, the Grand Boulevard line and steam railroads already mentioned, the other city and interurban lines connect with the new line at many points. At some of these points freight is diverted over city lines to its place of destination or delivered to outlying lines from points of origin in the city. The company is still permitted to carry freight over some of the city lines in the southern section of the city, a district which is largely industrial and where there are comparatively few residences of the better class. The belt lines and the Grand Boulevard line are so connected with the city system that they may be used for passenger traffic if that should be desired.



New car and bus shops of the Oklahoma Railway recently built in the suburbs to replace the old shops in the center of the city



One of the new 600-hp. electric freight locomotives equipped for either pantograph or trolley operation

When the company assumed operation of the two belt lines on May 1, 1929, it immediately put into service two 600-hp. electric locomotives. Three more of these locomotives have been built in the shops of the company. Each engine has four 150-hp. motors and weighs about 75 tons. The motors were manufactured by the Westinghouse Electric & Manufacturing Company and the trucks by the Standard Motor Truck Company. All other construction was done in the railway shops. The company also has several older 400-hp. electric locomotives, making a total of eight. Pantographs are used on the freight and belt lines and ordinary trolley equipment on other lines.

The general situation in the territory, in which the company operates, is extremely favorable. Oklahoma is enjoying a rapid commercial development along all lines. This is particularly true of Oklahoma City and surround-

ing territory. Building permits have exceeded \$1,000,000 per month for more than 2 years. Industrial development is moving forward, as is truck farming, poultry raising, dairying and other industries which create new freight and passenger business for transportation lines. A new oil and gas field has been opened almost in the southeastern suburbs of the city.

The Oklahoma Railway has adopted an aggressive policy in securing new freight business. It has also secured a permit from the Oklahoma Corporation Commission to operate interurban passenger motor buses along the highway paralleling its interurban line between Oklahoma City and Norman and has applied for bus permits to carry passengers parallel to its other interurban lines. Judging by the results so far accomplished, prospects are bright for a continued increase in both passenger and freight business.



Terminal station in the central business district of Oklahoma City serves both car and bus passengers.

The building at the right houses the offices of the Oklahoma Railway

The READERS' FORUM

Requirements of Materials for Car Flooring

JOHNS-MANVILLE CORPORATION NEW YORK, N. Y., May 7, 1929.

To the Editor:

An article appeared on page 687 in the Oct. 13, 1928, issue of ELECTRIC RAILWAY JOURNAL telling of the use of car flooring material, one of the constituents of which was a bituminous material.

In the March 23, 1929, issue of ELECTRIC RAILWAY JOURNAL in The Readers' Forum section, there appear some comments by R. C. Brett, research engineer of the Trundle Engineering Company, Cleveland, Ohio, under the title "Asphaltum Not Advantageous for Car Floors." The author of these comments makes a sweeping condemnation of car floors using asphaltum, on the basis of tests presumably conducted as part of his research engineering work. The unfortunate part of the author's comments is that by making his conclusions so specific and positive, he indicates very clearly that his tests have not been sufficiently comprehensive to include some of the more refined compositions of flooring, and show lack of familiarity with the subject of car flooring in general.

Simply by way of rebuttal, it might be well to state that it is not only possible but entirely feasible to furnish composition flooring composed of filler ingredients such as coke breeze, held together with a bituminous binder which will not exceed a unit weight of 0.9 lb. per square foot per \(\frac{1}{8} \) in. thickness. "The type of flooring now commonly used by railroads," as expressed by the author, rarely has a lighter weight than the figure mentioned, and if it does, this lighter weight can be secured only through the introduction of sawdust, wood fiber or other deleterious ingredients, which not only weaken the structure of the floor itself but increase its porosity to such an extent that water will readily pass through the floor.

With regard to the thickness of composition floorings now in general use, one would hardly be so optimistic as to expect a $\frac{3}{8}$ -in. thick composition flooring to give satisfactory service over a period of years, unless this composition flooring had sufficient mechanical strength to withstand in itself the stresses placed upon it, or else was sufficiently flexible to accommodate itself to these stresses without fracture.

To condemn a flooring material because it will soften under the heat produced by the combustion of the car is hardly justified by a consideration of contingent factors. It should be significant that composition flooring will not hurn unless its temperature has been raised above 550 or 600 deg. F. To produce this temperature other combustible materials would have to be present. In modern steel car construction this is barely possible. In old wooden construction the car would be consumed by fire beyond the point of further usefulness before the flooring would be seriously affected. Thus the composition flooring does not constitute a fire hazard, but, rather, it is a fire retardent, as you may learn from the Chicago Board of Underwriters.

The test results and scientific deductions or conclusions of research engineers are extremely valuable contributions to engineering literature and trade publications.

Obviously, such information is of value only if it reflects an unbiased or uninfluenced consideration of facts.

P. D. Mallay,

Chief Engineer General Railroad Department.

Maintenance Contest Teaches Better Methods

VIRGINIA ELECTRIC & POWER COMPANY NORFOLK, VA., May 15, 1929.

To the Editor:

Every subscriber to Electric Railway Journal is introduced to solutions of the other fellow's problems that not only teach him better and more efficient methods, but actually make for better maintenance all over the industry, in that each and every subscriber has before him a periodical review of such improvements throughout the electric railway field. The present maintenance contest, designed specifically for that purpose, is proving one of the most interesting and far-reaching ventures of



T. W. Sanderlin, carpenter shop foreman in Norfolk, Va., studying the practicability of a special clamp for preventing theft of rear-vision mirrors

its kind known of by the writer since his connection with the industry. In Oct. 27, 1927, issue the JOURNAL said editorially of a similar contest:

The many articles submitted show an earnest desire on the part of the men who submitted them to lower maintenance costs, to provide more efficient and better methods, to eliminate fatiguing operations and manual labor, to overcome troubles experienced in the various operations and to provide improved equipment to do the work.

That is just what the present maintenance contest is doing. For instance, the Virginia Electric & Power Company at Norfolk for some months past was troubled with the theft of rear-vision mirrors from the cars. In the Oct. 20, 1928, issue a contest item described a special clamp designed to stop such losses which had been tried out successfully on another property. Its adoption in Norfolk stopped the thefts.

This particular instance is but one that shows how a free interchange of ideas surely will bring to light methods that can be adopted with good results on any property.

C. B. Hall,

Chief Clerk, Mechanical Department.

Improved Armature-Dipping Methods Developed

By F. V. Skelley Superintendent of Equipment Des Moines City Railway Des Moines, Iowa

IFFICULTY in obtaining proper penetration of varnish when armatures were dipped led the Des Moines City Railway about two years ago to undertake a series of experiments from which the methods now used have been developed.

At first armatures were dipped in a tank of varnish for twenty minutes and after draining were baked for 48 hours. It was found that the varnish did not penetrate to the bottom of the slots although the coils were known to be loose. This condition was verified by tearing out the coils of several armatures after they had been dipped and baked. Other experiments were then made to improve conditions. A steel tank was built large enough to hold an armature. With the vat filled to the proper level with baking varnish of a standard make



Rectangular varnish vat in shop of Des Moines City Railway will accommodate six G.E.247-I armatures at one time. Circular tank in rear is used for larger armatures. Between rectangular vat and the wall is a 17-in. diameter pressure tank, 45 in. deep, for storage of surplus varnish

and the armature under test sealed in the tank, a vacuum of 25-in. gage measure was applied, followed by a pressure of 110 lb. per sq.in. After ten minutes of this treatment the armature was removed and the coils torn out. The results obtained were little better than with the twenty-minute dipping at atmospheric pressure.

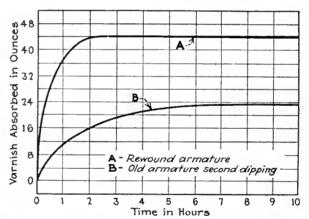
Soaking the armature in varnish was then tried, start-

ing with 24 hours' duration and decreasing the time to 18, 16, 12, and finally 6 hours, tearing the coils out each time to determine the amount of varnish in and around the bottom coil in the slot. As the penetration of the varnish was satisfactory for armatures soaked six hours or more, it was decided to test the rate of penetration up to six hours so that the time might be reduced to as short a period as possible for performing a satisfactory job.

A rewound G.E. 247-I armature was preheated as usual and submerged up to the commutator in a tank of varnish placed in a room where a constant temperature of 104 deg. F. could be maintained. The result as shown by curve A on the accompanying chart indicates that 2 lb. $12\frac{1}{2}$ oz. of varnish was absorbed in two hours and. that practically no further absorption took place up to ten hours. Next an old G.E. 247-I armature, that had



Armature shaft clamps of various sizes are neatly stored on a rack located directly above varnish vats



The rate of absorption of varnish declines rapidly after first 60 minutes as shown by armature test curves

received a previous dipping of twenty minutes, was soaked for ten hours. The rate of penetration was found to be much slower and the varnish continued to be absorbed for six hours. The temperature in this test was held constant at 112 deg. F. Only 1 lb. 3 oz. of varnish was absorbed by the armature during its second dipping period. The thickness of varnish adhering to a clean metal plate was one mill. The second soaking of the armature added two and one-half mills, or gave a total of three and one-half mills thickness of varnish on all metal surfaces.

As a result of these experiments, the armature-dipping equipment now in use consists of a rectangular metal tank 48x32 in., and 40 in. deep, in which six G.E. 247-I

armatures can be soaked at one time; a circular tank of 6 ft. depth and 30 in. diameter, in which all large armatures are soaked; and a pressure tank of 45 in. depth and 17 in. diameter, for the storage of surplus varnish. Air under pressure is admitted to this latter tank and varnish forced through a connecting pipe and valve into the rectangular vat. When the valve is opened and air pressure removed, the varnish flows back by gravity. It is thus possible to maintain 30 in. of varnish in the large vat irrespective of the number of armatures being dipped at one time. Hinged brackets along each side of the vat slip over the end of the armature shafts to hold them in a vertical position. The method of operation with this equipment is to take an armature that has been in service 80,000 miles, tighten the bands if necessary, and soak in varnish for six hours or more; then bake until the insulation resistance is satisfactory.

Some Essentials for Trolley Wheels

By Dr. James Silbestein Metallurgical Engineer, Chicago, Ill.

INVESTIGATION of service obtained from trolley wheels shows that the mileages obtained vary from 1,400 to 17,000 and that the cost per 1,000 car-miles varies from 2 cents to 33 cents. This wide variation indicates that more knowledge is needed regarding desirable characteristics for making trolley wheel castings and that their purchase should be subject to rigid inspection.

There are a number of factors which influence the life obtained from trolley wheels. Among these are electric conductivity, arcing properties, hardness, wear resistance and soundness of castings. Trolley wheels are made of copper-basic alloys. Their electric conductivity ranges between 10 and 70 per cent, the International Annealed Copper Standard being 100 per cent. While a high electrical conductivity naturally is desirable, this property is not as essential for long life as some other factors, and an electric conductivity of 10 to 20 per cent may be considered satisfactory.

The destructive action of arcing should be as small as possible. Alloys high in zinc result in more arcing and so are not suitable. A small percentage of zinc, up to 5 per cent, is beneficial since it has a deoxidizing and cleansing effect upon the metal. It has been found that the service performance of alloys containing 5 per cent of zinc is just as satisfactory as the phosphor bronze alloys. Lead which is added to bronzes to improve their wearing qualities is undesirable in trolley wheel alloys. Extensive tests have shown that the destructive action of arcing is greater for alloys containing lead than for lead-free and that the life of the wheels is less in the former case.

Hardness is not an essential quality of a trolley wheel alloy and a greater hardness is no indication of better wearing resistance or longer life. In general, the Brinell hardness of trolley wheel alloys ranges from 40 to 55. Service tests have been conducted with alloys having a Brinell hardness as high as 75 and the results of these tests indicate that the harder alloys were no better than the softer ones. The fact that hardness is not a measure of wear-resisting qualities has lead to extensive investigations on methods of testing abrasion resistance of metals. Finality in methods of testing for this purpose has not yet been attained and different types of abrasion testing

still yield results which are not comparable. In view of the great importance which the rate of wear has for parts such as trolley wheels, trolley wires, rails, treads of wheels, axles and bearings, a satisfactory abrasion test would be highly desirable, but so far it is necessary to resort to the slower method of testing in service.

Overhauling Cast Grid Resistors

By R. S. Beers
Railway Engineering Department General Electric Company
Schenectady, N. Y.

WHEN car equipments are overhauled the motor resistors should receive the same attention that is given the remainder of the equipment. They should be put in shape so that they will operate without further attention until the next overhauling period. Whether it is necessary to dismantle and rebuild the resistors may often be told by a visual inspection of them.

This inspection should be followed by an insulation test, a bank of lamps and trolley voltage between the grids and the resistor frame being used for this purpose. After this the resistance of the resistors should be measured. A simple means of checking the accuracy of the

resistance measurements is to measure the total resistance and also the individual steps. If the individual steps do not add up to the total, some error has been made.

the resistance is good deal higher (30 per cent or more) than called for by the manufacturer's connection diagram, it is desirable that the resistors be torn down and the grids restacked. The grid bosses, if they are rusty or if they have tiny pieces of

Burned contact surfaces—Systematic overhaul of grid resistors discloses conditions of this kind when they exist

mica sticking to them, should be thoroughly cleaned. The easiest, quickest and most successful means of cleaning them is with a sand blast. If the sand used is not too coarse, this method cleans off rust and any foreign matter, leaving the contact surfaces of the grid boss just as clean and parallel with one another as they are on new grids. Filing or grinding cleans the contact surfaces of the grid boss, although it usually reduces the conductivity because the surfaces are no longer parallel.

Grids with badly burned contact surfaces should be discarded. Where trouble from this cause is excessive it can be reduced by using a thin copper (about 0.01 in. thick) washer between the contact surfaces.

Design of

Maintenance Contest Trophy

Completed

IN KEEPING with the purposes and spirit of ELECTRIC RAILWAY JOURNAL'S maintenance contest, the design has been completed of the trophy to be awarded to the company rendering the most outstanding contribution, through participation in the contest, to the improvement of maintenance practice of local transportation companies. The final design is the beautiful example of the silversmith's art illustrated on this page.

The trophy takes the form of a wall plaque of bronze, mounted on polished wood. In relief across the upper part of the shield is an emblematic representation of the various phases of transportation maintenance work. The heroic size of the figures is symbolic of the importance of the human element in maintenance performance. This design, together with the lettering and the decorative border, are worked in sterling silver on the bronze shield.

After the final meeting of the judges, following the close of this year's contest on July 15, the name of the winning company will be inserted on the trophy in the space provided. The actual presentation will be made at

the coming convention of the American Electric Railway Association at Atlantic City this fall, and the trophy will be on display in Electric Railway Journal's booth in the new Atlantic City Auditorium.

In addition to the company trophy, there will also be awarded at the convention the individual cash prize of \$200 to the electric railway man submitting the best single item in the contest. Departmental certificates of merit will go to each of the four departments — equipment, way and structures, electrical, and bus—which re-

ceive the highest rating from the judges under the same terms as those used for selection of the company winner. At their coming meeting the judges will also select the winners of individual departmental prizes of \$25 each for the final period of the contest which closes on July 15. Winners of these cash awards will be announced in the August number of Electric Railway Journal.

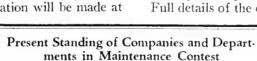
Entries Eligible to July 15

ITEMS submitted in this contest up to midnight July 15 are eligible for all of the prizes listed above. These entries are now coming in at a rapid rate as the closing date approaches. There is no limit on the number of items that can be submitted by any individual, department or company, and the total number of items entered by a department or company is one of the factors to be considered by the judges in awarding the departmental certificates of merit and the beautiful company trophy. The JOURNAL will pay \$5 for every item published which does not win a prize.

Full details of the contest were published in the Oct. 20,

1928, issue of ELECTRIC RAILway Journal. There are also available for the asking printed folders giving the conditions of the contest and suggestions for preparing entries. There is still time available for individuals, departments and companies to make a bid for these prizes. But the time is getting short, and this is the last announcement in the Journal before the close of the contest on July 15.

Mailed items must bear a postmark up to midnight of that date. Be sure to mark entries "Maintenance Contest."

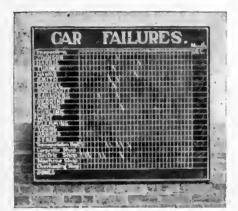


Department Company Winners Prizes Cleveland Ry. ... Track 2 { F. E. Davidson | Joseph Croyle Angus Scott L. Rose Line..... 1 Bus.....1 Total... 4 San Diego Electric Ry. Bus. 1 Charles Herms Equipment 1 Arthur C. Clegg Total... 2 Toronto Transportation Commission ... Line 1 L. H. McAdam New York Central R.R. (electrified

section) Equipment 1 Harvey L. Bullock

Devices and Practices Found Useful in Expediting

Maintenance Work



Blackboard used to classify car failures and to charge them against the employee responsible

Pull-Ins Charged to Men Responsible*

By C. B. Hall Chief Clerk Mechanical Department Virginia Electric & Power Company, Norfolk, Va.

AN ENERGETIC campaign against car pull-ins is being carried on by the Virginia Electric & Power Company, Norfolk, Va. One means which has proved successful in reducing car failures on the road is the use of a blackboard upon which pullins are charged against the particular inspection employee responsible. The blackboard is 43x49 in. in size and is placed at a conspicuous point on the wall of the inspection shop.

This has caused a feeling of personal responsibility for the failures when they occur, and as a result pullins have been reduced 46 per cent during a period of three months. This reduction reflects the extent to which better maintenance is carried out, and the more careful work done toward eliminating sources of trouble that would cause failure on the road.

Use of a special inspection form together with the inauguration of a system of classifying pull-ins has re-

*Submitted in Electric Railway Jour-*AL Prize Contest. Many maintenance ideas have been received which have proved of great value to men in the railway industry. What can you contribute?

BIGNATURI

Inspection form used by the Virginia Electric & Power Company

duced car failures considerably. The inspection form provides for signatures of the entire inspection force. In another column the work done is listed. Use of this has played a large part in bringing about the good performance figures.

The average miles per pull-in during the last six months of 1928 were as follows:

	_	-	-	-	-	-	-	-	-	-	_	÷	_	-	-	-		-	
Month																			Average Miles Per Pull-In.
July																			10,019
August	۰																		11,134
September																			15,088
October .	٠	٠	•	•					۰	۰	۰	٠							16,510
November		٠			٠			٠	•		•		•						16,889
December		٠	•	٠	٠			٠	•	۰	٠	۰	•	•	٠	•	٠	•	18,432

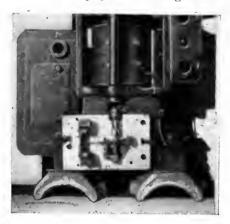
With one exception, the December submitted in E figure is the best showing made on NAL Prize Contest.

the property during the past ten years, certainly a convincing argument for close supervision.

Delayed Break Interlock for Circuit Breakers*

By Harvey L. Bullock Superintendent of Electrical Equipment Cleveland Union Terminal, Cleveland, Ohio

A DELAYED break interlock has been found of particular advantage on multiple-unit control equipment of the New York Central Railroad for preventing the burning out of operating coils by opening the circuit automatically. Its use also guards against broken operating switches and improper handling by the operator. It prevents burning of operating switches in the cab by distributing the arc over each individual unit of car equipment in long trains.



Type of delayed break interlock for remote control automatic circuit breakers and overload coils

The interlock is mounted on the side frame of the circuit breaker and is operated by connecting to a special main solenoid hinge pin with an insulated operating rod. This latter is connected to a contact lever under which is located a cushion spring.

*Submitted in Electric Railway Journal Prize Contest.

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The action of the interlock is delayed by the use of a toggle latch on the contact lever and is timed to unlatch at the moment of locking the circuit breaker in the closed position. The cushion spring, being compressed, then throws the lever to the unlatching or trip position if the operator desires to use the hand control in emergency. Two contacts are provided—an upper and a lower one. These are used for set and trip circuits. Magnetic blow-out coils to extinguish the arc have also been provided.

This device is now standard on New York Central cars with DB-102 circuit breakers and is also embodied in the late type of PC-10 controllers. It has practically eliminated circuit breaker troubles of this nature and consequent delays to trains.

Group Form for Testing Equipment*

By WILLIAM J. HANKEY Substation Division, Power Department Cleveland Railway, Cleveland, Ohio

ROUTINE work of testing and calibrating equipment in automatic and manual substations of the

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

Cleveland Railway has recently been arranged in group form. Use of the form not only enables the chief inspector to tell at a glance what particular piece of apparatus or mechanism is to be tested, but it also enables the test crews to prepare for the next test period or next apparatus to be tested. In the arrangement of the form, consideration was given to minimizing the transportation of test equipment from one plant to another. If several operations are necessary on some one piece of equipment, provision is made on the form to do this while the equipment is out of service.

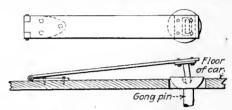
A schedule of testing and calibrating equipment in ten automatic and five manual plants is carried out by two men working but three days each week on this type of work. The remainder of their time is devoted to biweekly and detailed inspection, testing experimental hookups, graphic clocks and meter maintenance.

The group form sheet lists the various apparatus in their respective groups, the necessary testing equipment required for the work, the next date the apparatus is to be tested, the station involved, and the date the work is completed. In this way a complete yearly record of all testing and calibrating activities is recorded on one sheet.

Pedal Gong Ringer*

By Felix E. Reifschneider Engineer Ithoca Traction Corporation, Ithoca, N. Y.

THE forward location of the gong pin on one type of car of the Ithaca Traction Corporation was such that the motorman could only use his toe. If the pin were turned halfway it was locked to prevent ringing on the rear platform. Various circumstances caused the pin to be locked when it should have been available for



Pedal used to ring warning gong on cars of Ithaca Traction Corporation

operation by the motorman. To eliminate this serious trouble, a pedal was devised as shown in the accompanying drawing. A 6-in. hinge was screwed to the floor with the staple bolted to the underside at one end, which fitted a depression in the top of the pin, preventing accidental turning.

The increased leverage has two ad-

*Submitted in ELECTRIC RAILWAY JOURNAL Prize Contest.

			GROUP FOIM FO	R TESTING EQUIPMENT			
Group #1	Date Due	Equip. Required	Ste. Completed	Group #4	Date Due	Equip. Required	Complete
fanual Overspeed				Automatic Relay #25	1		
Heverse Current				* 28			
utomatic Kelay #18				" " 62			
24				Current Limit Resistance			
1 129					1		
# #32				Group #5			
				Manual IC Breaker Setting	1 1		
Group #2				Manual Ac Breaker Setting			
utomatic Relay #1				Automatic Relay 1			
W #2				" " 12	II		
	et.			" " 19	L		
				#13			
* 13				" #14 & #15A			
*14 & \$15▲				*27			*
" #23				42			
" " 127				1 #50			
" #42				H + 65			
" #50				" " 70			
" #65				170			
nspection automatic							
urrent limiting re-				Group #6	1		
ietance		t _e		Manual AC Overload and			
snual DC Breaker				Reverse Fower			
etting							
come				0 Am	1		
				Group #7			
Group #3				Automatic Relay "S"2-3 & 4			
itomatic & Manual Pole.			1	115			
ece Clearance		1	1	" #14 a #151			
mature Wedges				127			
tomatic helay 5-2-3 & 4	,			" 34			
n n #13				#42			
#14 & #15A				" #45			
" #34				. " #46			
" " #42				1 49			
* *50				#50			
" #53 " #65				7 65			
rathic Keters				Graphic Meters			
egger Rotarics				Megger Notarice			
				Sequence Drum #38			
quence Drum #38				Sequence brun # 30			
libration of sotary				Calibration of Rotary Flesh-	1		
lashover Relays		,	1	over Relays			

Type of group form used for testing substation equipment of the Cleveland Railway

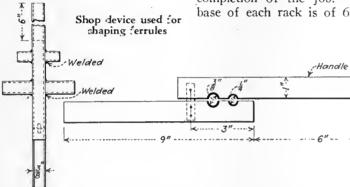
vantages, it produces a more intensive ring and the motorman also is able to locate the pedal sooner without looking for it, thus greatly reducing the chance for accident. The cost of placing this pedal on each car is \$1, which includes labor and material.

Form for Shaping Ferrules*

By H. J. BEADLE

Engineer of Equipment Dallas Railway & Terminal Company, Dallas, Tex.

IT IS THE practice of the Dallas Railway & Terminal Company to use ferrules over the ends of leads where they go into terminals. The ferrule is cut from tin and is pushed under the rubber covering of the wire



for a distance of about ½ in. Instead of using a pair of pliers to shape the ferrule on the lead, so that an accurate fit will result when the lead is placed in the round terminal hole, a form for shaping the ferrules is employed. This consists of two blocks 1 in. square and 9 in. long, the upper one being hinged to the lower so that the ferrules can be inserted and removed quickly. An extended section a little longer than the ferrules is welded to the two blocks so that pressure for shaping can be applied the full length of the ferrule. This forming tool makes the ferrules round and results in a close fit and satisfactorily soldered joh.

Reversible Screen Holders

By D. L. PATISON

Foreman Paint Shop
Omaha & Council Bluffs Street Railway
Omaha, Neb.

RACKS have been designed to facilitate the painting of street car window guards by the Omaha & Council Bluffs Street Railway. These racks hold the screens in such a position that after one side has been



Reversible holder which permits painting of both sides of window screens with a minimum of handling of wet surfaces. Five screens at a time can be accommodated

painted the whole frame can be turned over approximately 90 deg. to bring the other side uppermost for completion of the job. The wood base of each rack is of 6x2-in, tim-

ber, 30 in. in length. Six \(\frac{5}{8} - \text{in. rods}, 24 \) in. long, project from a curved metal base, made of \(\frac{1}{2} - \text{in. stock}, 3 \) in. wide. Details of the loose-pin coupling between upper and lower "rocker" iron sections are shown in the accompanying pictures.

New Test Rack for Air Equipment

By J. A. Duffy

Superintendent of Equipment Monongahela West Penn Public Service Company, Fairmount, W. Va.

AIR equipment of the cars of the Monongahela West Penn Public Service Company is subjected to rigorous tests after overhauling before it is allowed to pass for installation. A test rack has been designed to duplicate all the brake operations of every piece of apparatus of the automatic air equipment. This rack is used also for detail tests of safety car equipment and triple valves. The arrangement of the apparatus for these tests is shown in the accompanying diagram.

Among the various valves which can be tested on this rack are: brake valves, brake valves with selector valve, emergency valves, combined foot and cutout valves, pilot valves, and main reservoir cutoff valves. Other tests which may be made are the friction tests, the opening tests, the capacity tests, the test for ball check valve leakage, closing tests and porosity tests. In testing triple valves for railway service, an application and a release test will indicate roughly whether or not the triple valve should be removed for closer inspection or repaired on account of packing ring leakage, resistance, opening through ports, etc. The tests are made with 70 lb. in the supply line and with the test apparatus shown on the Westing-

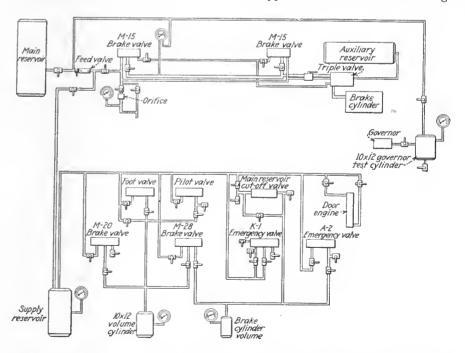


Diagram showing arrangements of valves, gages and reservoirs and the piping of a test rack for air equipment of the Public Service Company at Fairmount, W. Va.

^{*}Submitted in Electric Railway Jour-NAL Prize Contest.

house Air Brake Company's drawing F-31968.

In the event that a valve is removed from a car for test without first being overhauled, it should be taken down and inspected to make certain that the working parts are in good condition.

Particular attention should be given to the clearance of the lower valve stem and its bushings. Door engines and air compressors may also be tested satisfactorily with this test rack.

Reservoir Drain Valve **Operating Rod**

RAINING of air reservoirs on the cars of the Richmond Railways, Inc., Staten Island, N. Y., is on a definite time basis so as to prevent brake trouble. Still greater care is exercised during the winter months



Since this operating rod has been in use all tanks are kept drained

to guard against freezing. The reservoirs are installed in the center of the cars and it has been found very inconvenient to reach the drain valves unless the car is over a pit. When pit storage was impossible there was a tendency for the men to neglect the As a result freezing troubles were encountered.

A special operating mechanism was installed, as shown in the accompanying illustration to make the valve accessible and to assure drainage. will be noticed that a & in. round rod with an eye in one end is attached to the drain valve handle and extends outward toward the side of the car. This rod is supported by a $\frac{1}{4}x1$ -in. eye bracket 12 in. long fastened to the compressor supporting bracket. With this arrangement the reservoirs can be drained without the car being over a pit.

The possibility of accident has been reduced with this arrangement, as a man does not have to crawl beneath the car.

Testing Friction Tape

By G. H. McKelway Distribution Engineer Brooklyn-Manhattan Transit Corporation, Brooklyn, N. Y.

7 HEN it is desired to compare samples of rubber friction tape, or to obtain an approximate idea of their value, the usual method is to rub together pieces of the tape and then to pull them apart. It is a popular belief that the value of the tape can be determined by noting its stickiness or "tackiness." This is a mistaken theory, however, as the stickiness of a tape is not proof of its quality but, on the other hand, may be an indication of its worthlessness. The best tapes are those that have been compounded with a large percentage of new, high-quality rubber, and such tapes are seldom so "tacky" as those made up with less crude rubber and more rubber substitutes.

Another mistaken assumption is that tape of a light color is not as good as black tape. The color of rubber is gray, while the color of most of the cheaper substitutes is dark brown or black. Sometimes coloring matter is added purposely to the rubber compound to make it darker but, unless that has been done, the lighter colored tape is likely to be the better.

Still a third mistake in regard to tape is the belief that, when two pieces are pulled apart, the fibers of the compound should be long. fiber of good quality rubber compound, on the contrary, is quite short.

To decide upon a good make of friction tape, there are three things that must be decided: (1) strength of the fabric; (2) the holding power, not the mere stickiness, of the compound; (3) the insulating properties of the tape. There are standard laboratory tests which will determine accurately all of these qualities and, if possible, such tests should be made before purchasing large quantities. However, when only a small amount of tape is wanted, it is desirable to have some easy test which can be made by anvone and which will give approximate

For deciding on the strength of the fabric, a comparatively narrow strip of tape, say $\frac{3}{4}$ in. wide, should be taken in the hands and the two ends pulled apart until the tape breaks. By noting how much pull must be exerted to break it, an approximate idea of its strength can be gained. This is a very rough test, but any tape that breaks easily should be

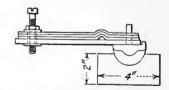
rejected.

For the second test, another strip of the tape should be bent back on itself and then forward again, so as to make a "Z" about 1 in. in length and made up of three thicknesses of tape. These three layers should be squeezed together firmly and the pressure maintained for three minutes. Then take hold of the ends of the tape and attempt to pull out the "Z" lap. It will be found that with a good quality of tape the fabric will break before the lap will open. The purpose of the "Z" lap is to insure that the compound on both sides of the tape is tested. Occasionally, a tape will be found with a better grade of compound or with it applied better on one side than on the other. A single lap will test only one side of the tape, whereas with the "Z" lap both sides come into contact with each other.

The voltage of railway circuits is so low that any well impregnated fabric will withstand it. Therefore, unless a higher voltage is available and can be used easily and safely, there is not much reason for making a voltage test; especially, since the tape might be good at the point tested and much poorer at a point an inch or two away. To make sure that the tape is impregnated well and uniformly, it should be held up to the light and any "pin holes" in it counted. There should be none, or, at the most, only one or two in a strip a foot long.

Form for Riveting Controller Finger Tips

IVETING new tips to controller Thinger springs used to be a troublesome job in the shop of the New York & Queens County Rail-



This fixture for riveting tips on controlling fingers has speeded up the riveting process and eliminated arcing failures

way, Woodside, N. Y. The new tips often caused heavy arcing after they were installed in the controller. Careful analysis of the cause of this arcing disclosed the fact that it was due to improper contact. This brought about by the existence of abrasions on the tip contact surfaces, which were made by the vise jaws during the riveting process, a condition which needed to be eliminated.

The riveting form shown in the accompanying sketch was developed for riveting the tips to the fingers and to prevent damage to the tip surface. It is made of steel and is 2 in square and 4 in long. The top surface is provided with a groove of such width, depth and contour as to conform exactly to the surface of the tip to be riveted. The tip is placed in the groove and the finger spring and shunt are placed over the rivet. The force exerted on the riveting process is distributed evenly over the tip surface and thereby prevents the formation of any abrasion.

Labor and Time Saving Pole Racks*

By C. B. Hall Chief Clerk Virginia Electric & Power Company, Norfolk, Va.

ANEW type of pole rack recently adopted by the Line Department of the Virginia Electric & Power Company at Norfolk, Va., has resulted in a saving of approximately 50 per cent in time and labor. Poles, needed by linemen, can now be rolled off the racks onto pole wagons or line cars, instead of being hauled from a pile in the yard. Five of these special racks have been erected along the company's yard siding.

Poles 15 ft. long, or less, are placed in the ground at a depth of 6 ft. resting on a base of concrete. These supports are braced with 12 x 12 in. obsolete bridge timbers and old Trail, and hold an assorted stock of poles ranging from 30 to 50 ft., each rack accommodating about 100 poles. The project, built entirely of discarded materials and by company employees at odd times, was completed at a cost of \$200.

*Submitted in Electric Railway Journal Prize Contest.



Removable gratings used to cover pits

Overhaul Pits Covered by Grating

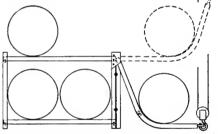
LL pits in the shop of the Surface **1** Transportation Company, New York City, bus subsidiary of the Third Avenue Railway, are covered by means of removable iron grating. This grating is made in sections 24 in. wide and $63\frac{1}{2}$ in. long. Each section is composed of nineteen strips of 3x116-in. flat iron spaced 1½ in. centers and braced by strips of \(\frac{1}{2} \text{s.in.} \) flat iron zigzagged through the space and riveted to each $\frac{3}{16}$ -in. strip. These sections can be removed readily to provide access to any part of the bus desired. This arrangement has been found very satisfactory and has prevented the men from accidentally falling into the pits.

Portable Barrel Hoist*

By F. W. Braund Superintendent of Power Conversion Cleveland Railway, Cleveland, Ohio

A ONE-MAN barrel hoist has been installed by the Cleveland Railway for use in an oil room where transformer oil is stored on a double-

deck rack, and where head room is insufficient to accommodate a portable crane. Eye bolts of ample size are anchored in the ceiling, mounted forward of the oil rack and directly over the eye of the barrel-hoist cradle. A $\frac{3}{4}$ -in. rod, forming the hinge, is removable and can be quickly attached to any one of the barrel compartment fronts. A light, $\frac{3}{8}$ -in. block and tackle is



Barrel hoist designed by the Cleveland Railway for use in store room where space is lacking for the operation of cranes

used as the hoisting medium, swinging the barrel cradle slightly above center, thus allowing the barrel to roll without the help or guidance of workmen. With this equipment, full barrels of material can be hoisted and placed several tiers high on a rack.



Improved appearance of the pole storage yard of the Virginia Electric & Power Company was obtained by the erection of racks

Convenient Chain Pipe Vise

THE new Vulcan Superior vise, recently placed on the market by J. H. Williamson Company, Buffalo, N. Y., has two outstanding advantages over previous models. The handle for adjustment is on top of the vise where it is easy to operate, while the jaws are reversible; i.e., when the teeth are worn the bolts



Chain pipe vise with reversible jaws has many advantages over previous models

have to be unscrewed and the iaws turned over. This feature prolongs the life of the vise considerably. In addition, the vise accommodates pipes which are $\frac{1}{2}$ in larger than previous models could take care of. The vise is made from tough wrought steel, drop forged base, jaw, handle and chain arm. It is finished in chrome plate and furnished in two sizes for $\frac{1}{8}$ and $4\frac{1}{2}$ -in. pipe.

White Designs 18-21-Passenger Bus

EXCEPTIONAL flexibility and safety under all operating conditions are claimed for a new bus recently put out by the White Company. The bus has four-wheel hydraulic brakes with Westinghouse vacuum servo to insure positive contact. The seating capacity in this six-cylinder bus, known as model 65,

New Products

varies from 18 to 21 passengers. From the standpoint of the operator it meets the popular demand for a medium-sized vehicle. Much attention has been given to accessibility of parts, making inspection and maintenance unusually convenient and economical.

Numerous orders have already been received for the new model, including an order for five from the Union Pacific Railroad for carrying tourists to the National Park of southern Utah.

Buzzer for Electric Railway Cars and Buses

IN A NEW buzzer recently put on the market by the Consolidated Car Heating Company, the sound is transmitted to the moulded base

which acts as a sound box, thus permitting the use of a totally enclosed cover which protects the mechanism from dust and moisture. Aside from its neat appearance, the construction is simple and rugged, and consists of a steel frame with a grounded coil, an armature and contact strip,

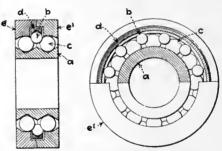


Compact car buzzer recently brought out by the Consolidated Car Heating Company, Inc.

Swedish blued spring steel, and tungsten contacts which are provided with a solid locking adjustment. The terminals are arranged for leads to enter from the back or from below, which reduces to a minimum the possibility of damage. The cover screws, terminals, and adjusting screw are all accessible from the front. The finish is in dull black. The buzzer is mounted vertically and is only $4\frac{3}{4}$ in. long, $2\frac{5}{8}$ in. wide and $1\frac{7}{8}$ in. high, with rounded ends. Usually one or two are installed in series with the standard fuse and resistance box for trolley voltage, or direct from any battery voltage, in which latter case the resistance box might be omitted.

Bearing Has Three Rows of Balls

IN GERMANY a new type of ball bearing with three rows of balls has been put on the market recently. The main feature in this new bearing is that a third row of small balls is used instead of a ring between the two rows of bearing balls, serving solely to keep the larger balls in the



Recently developed ball bearing of German design

two main rows from touching each other. The small balls, which are called distancing balls, are held in place by a grooved ring which revolves freely inside the body of the bearing. The construction of the bearing is shown in the accompanying illustration: "a" is the inner race having two grooves, one each for each row of bearing balls "c" and "c"."

The distancing balls are indicated by "b" while "d" is the ring holding them, and the outside race consists of two halves, "e" and "e'." The illustration shows that sliding friction is replaced by rolling friction.



Medium size bus for intercity service recently put on the market by the White Company

for the Railways' Use

Bob-tailed Shovel Has Reduced Clearance

TWO electric shovels recently purchased by the Cleveland Railway are unusual because they have been "bobtailed" to reduce the clearance required. The standard tailswing of 10 ft. 10 in. of the Lorain 75 has been reduced to 8 ft. 9½ in. Further reduction in clearance has been obtained by cutting off the left rear corner of the cab and rotating the platform on a diagonal, thus enabling the unit to swing further without fouling the adjacent track. In making these modifications, nothing has been radically changed on the crawler or superstructure, each of these retaining the Thew "center drive."

The new electric shovel is equipped with a 12-ft. or 14-ft. boom and a 10ft. or 12-ft. stick, giving reduced swing and height clearances desirable for street railway work. The electric motor used is a 50-h.p. a.c. or d.c. unit furnished in a range of types suitable for any ordinary current. Control of the motor is by means of an automatic push button just to the right of the operator. Power for the motor is taken through the truck and delivered to substantial brass contact rings bolted to the steel crawler frame and thoroughly insulated from it. Power is then transmitted up to the turntable by means of brushes sus-



pended beneath the turntable and contacting with the contact rings. Heavy leads in conduit carry the power from the brushes to the electric motor.

Compact Commutator Mica Drill for Heavy-Duty

ANEW undercutter manufactured by the Ideal Commutator Dresser Company, can operate in a space only $3\frac{1}{2}$ in. wide, and, therefore, offers an advantage over the previous model, because its use does not necessitate dismantling brushes, brush boxes, brush rigging, etc., and because no time is lost in reassembling them before putting the motor back in service. This saves from one to three hours on every job, and this time can be spent in undercutting, instead of getting ready to undercut and to reassemble.

It is claimed that this new cutter will not heat, jump, or chatter. A set screw is available to lock the depth gage, while a micrometer adjusting screw will raise and lower this gage. The roller guide can also be raised or lowered by a micrometer screw to conform to size of cutter used. The distance from the saw to the roller guide is less than the width of the average small copper bar, and thus permits the guide to be used on the next slot, requiring but one slot to be cut by hand. Another feature of this undercutter is the depth gage adjacent to the saw so that the actual depth can be easily measured. It will not mar the copper but will give a bearing support.

Drill for Heavy Duty

FOR heavy duty a low speed, \(\frac{3}{4}\)-in. drill has been developed by the United States Electrical Tool Company, Cincinnati, Ohio. An alternat-



Heavy-duty drill has a two-pole trigger switch and a three-jaw screw back chuck which can hold straight shank drill bits

ing-current or direct-current universal motor of 60 cycles or less operates the drill at 400 r.p.m., load speed. It has S.K.F. ball bearings, special thrust bearings in chuck spindle, and extra heavy chrome nickel steel gears which run in a grease-tight case. The armature is double silk insulated and enameled. The body frame and commutator head are made in one piece of aluminum.



This "bobtailed" shovel gives additional clearance between shovel and passing street car when excavation is continued during regular operating hours

News of the Industry

Governor Vetoes Missouri **Enabling Act**

Governor Caulfield of Missouri on June 25 vetoed the terminable permit bill passed by the recent Assembly and applipassed by the recent Assembly and applicable only in St. Louis, Mo. The measure was recommended by the St. Louis Transportation Survey Commission, Mayor Miller, other city officials and leading civic and business organizations. It was supported by the St. Louis Public Service Company and the People's Motorbus Company. The opposition was led by the St. Louis Post Dispatch.

Governor Caulfield held that the measure

was an evasion of the St. Louis charter, which restricts public utility franchises to a period of 50 years, and that it did not confer any additional powers on St. Louis, but authorized the Missouri Public Service Commission to grant permits or franchises for an indefinite length of time. The

Governor said:

"I would sign this bill were I not convinced that it is an unnecessary and unwise evasion of the charter-making power of St. Louis. All other cities, and even St. Louis County, are excluded from its pro-visions. It confers upon the State Public Service Commission powers that it can only exercise as to St. Louis.

"It would seem that the bill was not passed upon its merits but upon assurance to the Legislature that St. Louis, and St. Louis only, wanted it. It is called an enabling act, but I do not find that it confers upon the city of St. Louis any power which it does not now have, except the power to enable the Public Service Commission to grant such utilities a 'terminable permit' or 'indeterminate franchise' for a longer period than fifty years. The city may include in a franchise granted by it-self all of the features contemplated by the proposed law for contract ordinance precedent to the issue of the terminable

The Governor also stated that the people of St. Louis alone should decide whether the city charter should be amended to grant the issuance of terminable permits or in-determinate franchises for a period in excess of 50 years. He pointed out that it is important the friendly relations be-tween the people and public utilities be

maintained.

Committee Awaits Seattle Mayor's Efforts

Plans of the Traffic Research Committee at Seattle, Wash., engaged in maturing a program for rapid transit, will be held in abeyance pending the result of Mayor Frank Edwards' effort to re-finance the municipal railway system. The committee is in sympathy with the Mayor's plan, and it does not wish to embarrass him by the injection of other plans while proportions. injection of other plans while negotiations are pending looking toward the improvement of the present system. The committee found the physical and financial conditions of the system to be serious, and company maintain its tracks and equipment

agreed that rehabilitation of the railway is the first necessary step. It is not enthusiastic over railway extensions unless the matter of what is to be done about them is first studied in connection with rapid transit needs.

Chicago to Hasten Draft of Settlement Franchise

According to the present plans, the Council's committee will lay out the funda-mentals upon which the new ordinance toward unification in Chicago looking

should be drawn. This plan will then be submitted to the attorneys for the companies, the citizens' committee and Attorney Fisher, who will be asked to work with lawyers representing the City Council in the actual writing of the draft under the authorization contained in the enabling legislation passed by the Legislature and signed by the Governor. When a skeleton draft has been completed the lawyers will be asked to submit it to the Council's combe asked to submit it to the Council's committee. Then it is planned to hold extended public hearings on this draft, at which those who desire to present views on the ordinance will have an opportunity to

Unification Recommended

San Francisco city engineer would bring private and municipal lines together under a five-cent fare with deficit met by taxpayers

ITY ENGINEER M. M. O'Shaughnessy of San Francisco, Cal., on June 5 submitted to the Board of Supervisors, through the Board of Public Works, his "Report on the Street Railway Require-ments of San Francisco, with Special Con-Facilities," together with his valuation of the Market Street Railway properties. His report on the California Street Railway system was filed in December, 1928. The report on the transportation requirements is in a single volume of 400 pages, while the valuation of the Market Street Railway system occupies 7 volumes, approximating 3,500 pages, and the volume on the California Street system covers some 300 pages.

The preparation of the report required nine months' work on the part of a staff of experts and assistants under the direction of the city engineer. In a foreword to the report, Mr. O'Shaughnessy says: "It is almost axiomatic that, from the

standpoint of the riding public, the best service can be provided by a unified street railway system with universal transfers; also that, on a given wage scale, such a unified system, under a single management, can provide a given standard of service most economically.

"San Francisco, under mandate of the people, as expressed in our charter, is committed to the proposition of municipal

ownership of its public utilities.

"The municipality, in the operation of its own railway, after due consideration and by proper legal procedure, has adopted a standard of wages for its railway em-ployees. In this report, in the endeavor to evolve an operating plan, looking toward the continued maintenance of the 5-cent fare, no consideration has been given to the obvious possibility of a reduction of the wage scale, which has been considered as a fixed quantity.

"As a result of the studies made, it is

obvious that even the unified system cannot be operated on the municipal wage scale on a 5-cent fare, nor can the private in a satisfactory operating condition and render a proper standard of service on a

5-cent fare.

"The recommendation to cover any deficit, in the operation of a combined to the municipal system, by a subsidy from taxes, is considered to be sound in principle, and not without precedent, as witness New York. A plan of this kind is believed to be far more desirable than an increase in the rate of fare."

The following recommendations are made

in this report:

RECOMMENDATIONS TO PURCHASE

RECOMMENDATIONS TO PURCHASE

1. That a Public Utilities Commission be established for the purpose of administering the utilities of San Francisco, as is now being done in New York and Detroit.

2. That the city acquire by purchase the properties of the California Street Cable Railroad and the Market Street Railway at the most advantageous figure possible to be arrived at through the negotiations authorized by Ordinance No. \$125.

3. That the negotiations with the California Street Cable Railroad be on the basis of purchasing it on its earning value, namely, \$604.463, as set up in my report on that company, and that negotiations with the Market Street Railway be held with a view to securing their property for \$17,500,000.

4. That the properties of the Market Street Railway and the California Street Cable Railroad, if and when secured, be combined and operated with the Municipal Railway.

5. That the fare be retained at 5 cents

Railway.

5. That the fare be retained at 5 cents with a universal transfer privilege.

6. That deficits resulting from the unified operation and retention of the 5-cent fare be met by additions to the tax rate.

Mr. O'Shaughnessy says that to carry out these recommendations, it will be necessary to reach an agreed price with the two companies and to submit to the electors a proposal to issue bonds to cover the cost of purchase of the two private systems, and provide sufficient money to cover all deferred maintenance and the additional facilities which have been recommended. Further bonds should be authorized to be sold from time to time, as the necessity arises, to meet the increased capital cost incident to rehabilitating the tracks of the

The amount of these bonds company. should be sufficient to allow an expenditure of approximately \$500,000 annually for several years.

OPERATING RECOMMENDATIONS

The following additional recommendations are made, contingent on the acquisition and unification of the three roads, with the idea of securing the most economical, efficient, and satisfactory operation of the combined system.

1. That the rerouting plan set up in this report, with such modifications as developments may show to be necessary, be placed

ments may show to be necessary, be placed in effect.

2. That, in order to speed up the transportation in the downtown district during the rush hours, all parking of vehicles be prohibited between 7 a.m. and 10 a.m., and between 3 p.m. and 6 p.m., on the streets north of Howard Street, south of Bush Street, and east of Larkin Street, with extensions on Mission Street to 12th Street, Market Street to Valencia Street, McAllister Street, O'Farreli Street, Geary Street and Sutter Street to Valencia Street, McAllister Street to Van Ness Avenue.

3. That all itenses to operate jitney buses be withdrawn and their operation be prohibited.

4. That the practice of exchange of the street in the street of exchange of the street in the street of exchange of the street in th

prohibited.

4. That the practice of exchange of transfers between buses and street cars be discontinued.

5. That the raiiroad system be relieved of air costs of paving except those incidental to making track repairs and any additional cost of street paving occasioned by the presence of track.

6. That the skip-stop method of operation be placed in effect where street spacing permits.

be placed in the permits.

7. That the United States Post Office Department be required to pay the transportation of its employees on duty now

In making his recommendations, the city engineer has given careful consideration to the possibility of acquiring the private roads piecemeal as their franchises expire, but has determined that such a procedure would be contrary to the best public interest, as it would inevitably lead to poor service and further deterioration of the properties re-maining in the hands of the companies. Without the consent of the companies to a universal transfer system, many patrons

would be forced to pay double fare.
In discussing the situation at hand, due to the expiring franchises of the Market Street Railway and the California Street Railroad, the city engineer points out that the time has now arrived when, through the expiration of these franchises, it becomes necessary for the city to make a definite decision and plan of action. The city should either carry out the charter mandate by taking over and operating the systems of the private companies or adopt a plan whereby the private organizations can continue to render the character of service necessary, keeping in mind the ultimate acquisition by the city. The city engineer's studies show that the Market Street Railway has already been compelled to defer track reconstruction to such an extent that \$550,000 should be expended at this time to catch up this deferred maintenance. In addition a definite program of reconstruction should be carried out over a period of years.

The study of the Market Street Railway finances and its track condition makes it evident that on the basis of a 5-cent fare the private company cannot indefinitely maintain its tracks and equipment in condition to render satisfactory service, and that a continuation of the operation on the 5-cent fare under private ownership means that both the quality of the service and the condition of the property will de-

teriorate year by year.

A high standard of street railway service is essential to the continued growth and prosperity of San Francisco, and the city engineer points out that this high standard of service can best be rendered under a unified system, with universal transfers,

and if the 5-cent fare is to be maintained, with the high standard of wages paid by the municipality, this can only be done through a contribution from taxes. This follows, of course, only if the present trend in street railway traffic continues, as it has for several years, distinctly downward.

The city engineer justifies this recom-

mendation for contribution from taxes as being sound, in that it puts a portion of the burden of maintaining this high standard of service on the taxpayers whose properties and business are directly benefited by such service, instead of leaving the entire burden on the riding public.

VALUATION OF THE MARKET STREET RAILWAY PROPERTIES

The city engineer finds the value of the Market Street properties as of June 30, 1928, on the reproduction cost basis, as \$46,625,506, which, after making allowance for the depreciated condition of the properties, reduces it to \$29,369,331. Certain ot the company's properties would be eliminated if the city were to take them over. The value of the properties to be taken over on the reproduction cost less depreciation basis would be \$27,997,344.

The market value of the outstanding securities of the Market Street Railway, based on the high price for the first three months of 1929, was \$16,273,496, and the low price for the same period, \$13,206,769.

The city engineer suggests that in his opinion a figure of \$17,500,000 would be a fair price for the city to pay for the properties which it would desire to take over. In his report on the California Street Cable Railroad's properties, the city engineer found the reproduction cost of the entire properties to be \$2,252,458, and after allowance for depreciation this figure was reduced to \$1,097,404. After eliminating property which the city would not require, the reproduction cost less depreciation was reduced to \$903,704. In this report the city engineer recommended a purchase price not to exceed \$604,463 for the properties which the city desired to secure.

The city engineer has made a compre-

hensive survey and study of the traffic of the Market Street Railway lines. On the basis of the data secured, he has worked out a plan combining the Municipal Railway system, the Market Street Railway system, and the California Street Cable Railroad system into a single unified system involving a complete re-arrangement of routes and designed to give an excellent and improved service to all sections of the city. Such a plan will materially improve traffic conditions on Market Street and effect economies of operation, while improving the service. The number of lines operating on Market Street east of Sutter Street under this plan would be reduced from 20 to 13, and between 4th Street and Geary Street from 13 to 9, with corresponding reductions in other sections. The city engineer also points out additional necessary changes in routings which will further improve Market Street conditions if the transbay bridge is built.

Details of 53 proposed new routes are presented which show that it will be possible to operate service equivalent to or better than that now operated, with a reduction of between 3,500,000 and 4,000,000 car-miles per annum-approximately 10 per cent of the total car mileage now operated by the three systems. On the basis of the operating cost of the Municipal Railway system, \$750,000 to \$1,000,000 a year would be saved on this particular item on the unified system.

Tables show estimates of the financial results of municipal operation of the combined systems on the basis of continuing

the 5-cent fare, and making allowance for the estimated loss of revenue occasioned by universal transfers. On the basis of these estimates, under the present municipal wage schedule, the unified system, with the proposed rerouting of cars, after providing adequately for depreciation of the proper-ties, would indicate an operating deficit of \$869,667 annually, as compared with an operating deficit of \$1,623,648, if the present service were to be continued under the municipal wage scale. These deficits do not take into account interests and ultimate fixed charges. When the interest and fixed charges are added to the operating deficit, on the basis of the purchase price suggested by the city engineer, the gross deficit would be \$2,741,867 annually. This figure would be reduced to \$2,346,867 as the result of certain increases in revenue and decreased operating costs which would result if certain other of the city engineer's recommendations were put in effect. On the basis of an assessed valuation of \$850,-000,000, this latter figure would amount to 27.6 cents on the tax rate.

Changes in Southwestern Association's Plans

At a recent meeting, the governing body of the Southwestern Public Service Association, Dallas, Tex., made several changes in the constitution, so as to permit and encourage even greater cooperation in the future, than in the past, with the other associations with which the Southwestern is affiliated. Most important of these were provisions to waive separate Southwestern conventions and encourage attendance by the membership at suitable regional conventions of their craft; especially the Southwestern division, Natural Gas department, American Gas Association, Southwest Geographic division, and National Electric Light Association. Provision will be made, however, to have group or sectional meetings at such times and places as will be profitable for any of the groups or sections which constitute the association.

As for the past 35 years the Southwestern will represent the interests of the gas, the electric, the railway, and the telephone companies, in Texas and Louisiana. An advisory council, to consist of one representative from each of the member companies, is to convene from time to time to consider the general affairs and policies of the association, and elect an executive committee.

The officers and executive committee selected for 1929-1930 are:

President, Knox Lee, Southwestern Gas & Electric Company, Marshall, Tex.

First vice-president, chairman gas section, Frank L. Chase, Vice-president, Lone Star Gas Company, Dallas, Tex.

Second vice-president, chairman elec-ic section, J. W. Carpenter, president, tric section, J. Texas Power & Light Company, Dallas.

Third vice-president, chairman rail-way section, W. B. Tuttle, president, San Antonio Public Service Company, Antonio, Texas.

Other members of the Executive Committee are: George H. Carter, vicepresident, Texas Utilities Company, Marlin, Texas; J. G. Holtzclaw, vice-president, Gulf States Utility Company, Beaumont, Texas; W. L. Prehn, general manager, Southwestern Bell Telephone Company, Dallas, Texas; treasurer, R. G. Soper, vice-president, Dallas Gas Company, Dallas, Texas; secre-tary, E. N. Willis, Dallas, Texas.

New Youngstown Grant

Service-at-cost continued under an arrangement designed to secure a liberal flow of capital for investment

UNE 21 marked the date of operation by the Youngstown Municipal Railway, Youngstown, Ohio, under its new 25-year franchise passed by Council on May 22 and signed by the Mayor on May 25. Among the outstanding features of the grant are the following:

Among the outstanding reathers of the grant are the following:

1. Continuance of service-at-cost arrangement in effect during past ten years.
2. A new provision regarding repairs in paved streets, under which the company is required to repair only such paving as may be damaged or disturbed on account of operation of cars or damaged or disturbed on account of necessary repairs to tracks, rails, or joints in the rails.

3. A provision regarding new paving or reconstruction of paving by which the company shall be assessed only that amount which represents the increased cost of paving foundation under its tracks in excess of what the cost would be to the city in paving in case there were no car tracks.

4. A provision that all expense of change in tracks, pole lines and paving necessitated by public improvements shall be borne by the city and paid by city.

5. The company is authorized to operate over all bridges and grade separation viaducts now owned or controlled by the city of Youngstown. In case of the construction or reconstruction of bridges over which the tracks of the company exist or may hereafter be laid, the company exist or only for the tracks and appurtenances thereto and only such part of the cost of the bridge or viaduct as shall actually be occasioned by the construction of the tracks.

6. A provision that on and after Jan. 1,

occasioned by the construction of the track or tracks.

6. A provision that on and after Jan. 1, 1930, all expense in connection with the office of the Street Railroad Commissioner including salary of the commissioner and any employees of his office, shall be borne and paid by the city.

7. A provision that should the city suffer, aid, permit or foster competition in transportation except by such companies as are now operating under franchises heretofore granted by the city to such companies, individuals or partnerships as are now operating city ordinance, the city shall then lose control of the service and rate of fare provided for in this franchise and such loss of control shall continue so long as competition is permitted by the city.

8. Provision is made that the company shall be allowed to earn (after taxes and depreciation) 6 per cent on its present capital, and one-half of any excess above such permitted return after \$100,000 is accumulated in the surplus fund of the company.

company.

The new franchise was prepared by a committee of fifteen of the most prominent citizens of Youngstown, appointed for the purpose by the City Council in May, 1928. The chairman of this committee was the president of the largest financial institution of the city and other members of the committee represented in an executive capacity other financial in-stitutions, other large industrial concerns and other business interests of the city. The committee commenced to function actively in September, 1928. Public hearings were held.

Against Hasty Action on Pittsburgh Subway

George S. Davison, chairman of the City Transit Commission, at Pittsburgh, Pa., has asked delay on any action in the nature of a commitment on any subway plan at this time. It is pointed out that on June 25 the special election will take place on the metropolitan city question and that in the new charter plan consideration has been given to the district assessment plan of financing such improvements.

Mr. Davison regards it as desirable that

the city get the proper start in the financing of subway construction, "by utilizing the special assessment method to help pay for its initial subway construction and thereby make less difficult the application of this plan to later subway projects.'

Specifications Out for Lackawanna Electrification

Equipment specifications for the multipleunit cars for use on the Lackawanna Railroad electrification out of Hoboken, N. I., are now in the hands of the manufacturers, and it is anticipated that bids will be received in the near future. Bids already are in for the catenary structure and the contracts may be awarded within the next

As noted previously, power contracts have been signed with the Public Service Electric & Gas Company, the Jersey Central Power & Light Company and the New Jersey Power & Light Company for supplying power for the entire electrification. The contact line will carry 3,000 volts direct current.

\$10,000,000 Annual Parking Loss in St. Louis

Elimination of all parking in the down-town sections of St. Louis, Mo., is being considered by the Traffic Committee of the St. Louis Safety Council. Oliver T. Remmers, chairman of the committee, personally favors the elimination of parking, saying that the Council's contention is right that the streets were designed for the movement of traffic rather than for the storage of unused automobiles. It has been estimated that the parking of automobiles in downtown streets costs the city \$10,000,000 annually through loss of business that otherwise could be obtained from tourists and other visitors.

Exhibition No. 12

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American Electric Railway Association 292 Madison Avenue, New York City

Promptly

Governor Comments on New Chicago Bills

Governor Emmerson of Illinois has signed the Chicago traction bills passed by both branches of the General Assembly. In going over the bills before they were signed by the Governor, attorneys discovered that House Bill 513, amending the cities and villages act, was faulty and so a Senate bill was substituted. The attornevs declared that the change in no way affected the group of bills approved.

The Governor issued a statement in

part as follows:

part as follows:

On Dec. 6, last, Judge Wilkerson, before whom receivership proceedings are pending involving one of the surface lines companies, appointed a committee of prominent citizens to work out a definite plan of settlement upon which the city and the companies could agree. The bills now before me, with the exception of House Bills 515 and 737, are the result of the efforts of this committee.

The six agreed bills were submitted to the City Council for approval and were endorsed by practically a unanimous vote. They were agreed to by the companies and were brought to Springfield by the citizens' committee and the local transportation committee of the City Council.

The fullest opportunity was given in both branches for thorough consideration of all of these bills. They were passed in the House by upwards of 110 votes and in the Senate by 41 votes.

The measures are properly safeguarded by provisions that any ordinances drafted under them must be submitted to a vote of the people before becoming effective. The bills do not in themselves settle the traction question, and no settlement can be effected until the City Council has agreed upon the terms of settlement and the people, at a referendum, have approved the action of the Council.

For many years the ideal of those who have studied local transportation in Chi-

at a referendum, have approved the action of the Council.

For many years the ideal of those who have studied local transportation in Chicago has been unification of surface and rapid transit facilities, with subways in the congested areas, all operated on the basis of a unit fare with transfer privileges.

The citizens' committee and members of the City Council believe these bills give the city all the authority it needs to work out an adequate unification plan.

Under their terms the city has the power not only to determine the details of the plan of settlement, but also to regulate operation, rates and service, and the right of purchase by the city, should that be desired, is protected. In the arguments of those who request the vetoing of the bills no good reason has been offered for setting aside the judgment of the City Council and the two Houses of the General Assembly.

The terminable permit measure, one of those approved, applies to the entire state. Bills will be enacted July 1.

More Seven-Cent Schedules Rejected in New York

The New York Transit Commission on June 18 rejected as illegal the 7-cent fare schedules filed by the Eighth & Ninth Avenue Railways on July 16, 1928. The ground for the decision was the same as that given in rejecting the higher fare plea of the Drydock, East Broadway & Battery Company three weeks ago, namely, that the company had proceeded under the wrong section of the Public Service Commission law. The regulatory body made the point that the 5-cent fare under which the company operates in the city of New York was "contractual in nature" and could not, therefore, be altered by the commission. The opinion altered by the commission. added that it was doubtful whether the company, even if granted a 7-cent rate, could meet the competition of the rapid transit lines and other surface lines along its routes.

Late News Briefs

Tulsa, Okla. - After crippling transportation facilities for two days, employees of the Oklahoma Union Railway returned to their positions on June 18.
The differences between the company and employees were submitted to the State Board of Arbitration and Conciliation. The strike was the second transportation tie-up in the history of Tulsa. It resulted from a request for a 3-cent hourly wage increase by members of the local union, and for a seven-day vaca-tion each year on full time. Wages now range from 45 to 55 cents an hour. The company has not earned operating expenses at any time since the present owners took over the property in 1923.

St. Louis. Mo.-The St. Louis Electric Terminal Railway has asked the Board of Public Service to secure the vacation of a 127-ft. section of Brooklyn Street in connection with the construction of its proposed elevated and subway line which will connect the McKinley Bridge with a new passenger-and-freight terminal at Twelfth Boulevard and Washington and Lucas Avenues. Property owners have signed a waiver of damages.

Seattle, Wash. — G. B. Avery, in charge of the municipal street railway, has ruled that trainmen must stand an inspection every three months, under the critical eyes of station masters. Full length mirrors and shoe-shining stands are to be installed in each carhouse, and conductors and motormen are to be supplied with snappy new badges and new gilt cap bands to replace the cap insignias now worn.

Louisville, Ky .- Harland Bartholomew has explained to Mayor Harrison and members of the City Planning and Zoning Commission a preliminary major street plan which he has prepared as the first phase of a comprehensive plan for Louisville. Mr. Bartholomew said that Louisville has 597 miles of streets and the plan adds 9 miles to this total and makes 140 miles of the city streets major thoroughfares which will accommodate from four to eight lines of traffic. The commission arranged for a committee of its members to make revisions and suggestions before it is adopted as a layout of the principal traffic streets for the city until 1980. On this committee is Frank H. Miller, vicepresident of the Louisville Railway.

St. Louis, Mo.-Transit News, published by the St. Louis Public Service Company, has come out for the climination of parking in streets occupied by street cars, especially in the congested districts. The railway's research department estimates that each automobile parked in the downtown streets occupies space valued at \$5,000, and that the rental and tax value of this space is \$375 a year. This does not take into consideration the tremendous economic This does not take into loss caused by the delay to patrons of the railway by the unwarranted congestion caused by parked automobiles.

Canton, Ohio.-The Canton Street Car & Bus Company has been incorporated by A. C. Blinn, president of the Northern Ohio Power & Light Com-pany, J. B. Young, his secretary, and Windall L. Willkie, chief counsel for the company, to furnish Canton with transportation by street car, all bus, or a combination of the two in accordance with plans matured previously, to which reference has been made before in the ELECTRIC RAILWAY JOURNAL.

Cuyahoga Falls, Ohio.—An agreement has been reached between the City Council and the Northern Ohio Power & Light Company whereby the street cars will be taken off Front Street and routed over Second Street, both north and south bound, for a period of 30 days beginning June 10. During the same period a crosstown bus service will be established from Cleveland Boulevard on Northampton Road over Northampton, Portage, Newberry, Tallmadge, High, and back over Portage to Northampton and Cleveland. The experiment is to be tried without committing either the city or company to any definite program as to the permanent discontinuance of car service on Front Street.

Joplin, Mo. — The Missouri Public Service Commission at Jefferson City on June 21 authorized the Southwest Missouri Railroad to charge in Joplin a cash adult street car fare of 8 cents with two tokens for 15 cents and 3 cents for children. This is an extension of the adult fares authorized by the commission in April, 1928, for a period of thirteen months.

Ballston Spa, N. Y.—The Public Service Commission on June 6 directed the Kaydeross Railroad to repair its railroad. The line is electrically operated, is 12 miles in length, extending from Ballston Spa to Nill Grove where it serves the two mills of the Kaydeross Paper Company and the Cotrell Paper Company. There are two passenger trains a day.

Indianapolis, Ind. — Public bequests of approximately \$160,000,000 to be available in 2129 are made in the will of the late Will A. Latta, attorney for the Indianapolis Street Railway, filed

for probate here on June 13. It provides for \$50,000 to be kept intact for 200 years at compound interest.

Frankfort, Ky.-The possibility of the State of Kentucky developing a State Utilities Commission appears slim. At the last session of the Legislature a special committee was named to investigate and report on the needs of state regulation of the various public utilities. The chairman says that as representatives invited to discuss the matter had failed to put in an appearance, it would seem that there was not much demand for a utility commission or any reason to recommend establishment of a commission.

Flushing, N. Y.—Edward A. Roberts, manager of the New York & Queens County Railway, convinced that the "Orange Trolley" is the quick, convenient way to New York, recently distributed a little folder containing a homily on the utility of the route, a map of the district served and last, but notleast, a complimentary ticket in the form of a stub "good for one continuous passage on June 21, 22 and 23, 1929, on inbound cars to New York only."

New York, N. Y .-- An independent Socialist attack on the transit policy of the present administration in New York City has been launched by Louis Waldman, former Socialist candidate for Governor, who has addressed a letter to Mayor Walker in which he asks sixteen questions intended to clear up a situation that is "full of talk about transit and new subways and no results.'

Dallas, Tex.-Residents of East Dallas have asked the City Commission to require the Dallas Railway & Terminal Company to extend the Junius Heights line to Greenville Road and Llano Street in accordance with Everman Plan No. 5. Opposition was registered to the plan to continue the present shuttle bus service in lieu of the extension of the line.

New York, N. Y .- The New York Transit Commission has ordered the Brooklyn-Manhattan Transit Corporation to expend \$2,500,000 for new cars. Railway officials intimate they will comply with the order. The commission is considering the matter of seeking the appointment of a receiver to take charge of all revenues of the Interborough Rapid Transit Company in excess of the \$6,335,000 annual profit guaranteed by the city on the company's lease of the city-owned subways.

Chicago, Ill.-The Woods electrification bill providing that all steam rail-road terminals in Chicago shall be electrified before 1933, the cost to be met by sale or lease of air rights, was killed in the Illinois Senate, as that body pre-pared to adjourn for the summer.

Schenectady, N. Y. - Riders' Guide has been started by the Schenectady Railway in the form of a four-page leaflet $6\frac{1}{2}$ in. deep by $3\frac{1}{4}$ in. wide. The first issue is dated June 15. It is intended to print messages as to company policy, schedules, service, safety and any other topics that may be of an in-formative nature. Students of the Junior High and High Schools of Schenectady and Scotia were asked to suggest names for the new publication and the name decided upon by the commit-tee was suggested by Miss Agnes Svolos, who received an award of \$10 from the company.

COMING MEETINGS

July 1-2-National Motor Bus Division, American Automobile Associa-tion, annual meeting, Hotel Lafay-ette, Buffalo, N. Y.

July 10-11—Regional Conference of New England Electric Railway Executives, Copiey Plaza Hotel, Boston, Mass.

July 11—New York Railroad Club, annual outing, Travers Island, N. Y.

July 17—Central Electric Traffic Association, Miami Hotel, Dayton,

July 24-26—Electric Rallway Association of Equipment Men, Southern Properties, Lafayette Hotel, Lexington, Ky.

July 26-27—Central Electric Railway Accountants' Association, Angola, Ind.

Aug. 15-16—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.

Aug. 27—National Association of Railroad and Utilities Commission-ers, Glacler National Park, Mont.

Sept. 28 - Oct. 4 — American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium.

Nov. 20-21--Association of Electric

Nov. 20-21—Association of Electric Railway Equipment Men, Middle Atlantic States, Richmond, Va.
Nov. 21-22—Public Utilities Association of Virginia, annual meeting, Chamberlain-Vanderbilt Hotel, Old Point Comfort, Va.

Recent Bus Developments

Uniform Specifications Discussed

Bus specifications as drawn up by the National Automobile Chamber of Commerce, Bus Transportation, the Connecticut Public Utilities Commission, the Society of Automotive Engineers, and the Motor Vehicle Conference Committee were discussed at the joint meeting held on June 20 and 21 in Washington, D. C. The purpose was to try to standardize the principal dimensions and equipment of buses. Although the desirability of this was recognized, several members of the code committee felt that standardization might impede the development of the bus.

The opinion was advanced that what might be considered a desirable feature to-day may easily prove to be old fashioned five years hence. At such time, a state commission inspecting a bus of improved design would not accept it because it would not conform to the regulations laid down five years previously. It was thought that enough leeway should be maintained in the specifications to allow the manufacturer to incorporate his new ideas in the bus, thus giving the operator the benefit of experience gained during past years and not retarding development by regulations.

One of the changes made in the proposed

One of the changes made in the proposed rules is that a maximum length of 40 ft. be allowed, but leaving a loop hole for state commissions to reduce this maximum length if considered desirable. This overall length is to be measured from bumper to bumper. Although a prolonged discussion took place concerning the desirability of including the sleeper buses in the code, it was thought that, due to insufficient experience, it would be inadvisable to do so.

Railways Protest Queens Bus Service

Supreme Court Justice Strong in Brooklyn reserved decision on June 26 on the application by the New York & Queens County Railway and the Steinway Railway for an injunction to restrain the Long Island Transportation Company from maintaining a bus service between Astoria and Elmhurst. At one point, Justice Strong in interposing his own opinion said he thought transportation service "could be improved." Justice Dike suspended operation of the buses recently pending the outcome of the litigation. The petitioning companies, maintain trolley lines in Queens. They contend that the defendant company is engaged in unfair competition. A. T. Davison, counsel for the railways, argued that the bus company also was operating without franchise or certificate of convenience and necessity.

Another Westchester Route Sanctioned

On June 25 the County Transportation Company, Inc., was granted a certificate of public convenience and necessity by the Public Service Commission to operate a bus line in the village of Mamaroneck, Westchester County, New York. The petition for the route was a result of the abandonment of the service of the New York & Stamford Railway in various cities and towns of Westchester County. Com-

missioner Van Namee pointed out that the granting of the certificate completes the chain necessary to allow continuous operation over routes in Westchester County formerly operated by the trolley line. It is a further move in the series referred to in Electric Railway Journal News for June 22, page 82.

Co-operation in "Save-a-Life" Campaign

The People's Motorbus Company and the St. Louis Public Service Company cooperated in the "Save-a-Life" campaign in Missouri during June. One of the things they did was to have all of their buses and other automotive equipment inspected by the authorized service stations. The bus companies have found that a very large percentage of all accidents between their buses and other motor cars is due to the defective brakes or steering mechanism of the other cars.

Two Cases Before Illinois Commission

Two cases, both involving bus problems, are before the Illinois Commerce Commission. In one the Chicago Railways and the Chicago Motor Coach Company are involved, and in the other the Chicago & Joliet Electric Railway, the Illinois Traction System and the Tri-State Bus Company.

Some time ago the commission authorized the Chicago Railways to operate buses over certain streets, later rescinded the order, and then authorized the Chicago Motor Coach Company to operate buses. The railway filed suit in the Supreme Court, which holds that the commission arbitrarily exercised its authority when it granted the bus company a permit. It sent the case back to the commission with instructions that the railway be given a hearing.

A hearing in the other case was set for June 27. Some time ago, after 16 companies had been involved, the commission ordered the Chicago & Joliet to operate between Chicago and Joliet, the Alton Transportation Company, a bus line owned by the Chicago & Alton, from Joliet to Carlinville; and the Illinois Traction System between Carlinville and East St. Louis. When the Alton failed to operate, the commission issued an order to the Tri-State Bus Company to operate from Chicago to East St. Louis, whereupon the two electric railways again petitioned the commission.

More Buses for Eastern Massachusetts

Buses will be substituted for cars by the Eastern Massachusetts Street Railway on the Wakefield, Stoneham-Winchester route on July 7. The change has been timed to coincide with the rebuilding of streets constituting the through route from Wakefield to Stoneham, so that the rails may be removed before the roadwork is started by the state. The Wakefield-Stoneham line was opened 37 years ago next August as the beginning of a net work that for many years made Wakefield the electric railway center of northern Greater Boston.

Trucks Curbed That Bootleg Excursions

Competition of trucks insured to carry merchandise but which on Sundays and holidays run afoul the bus lines by carrying picnic and outing parties has been effectively stopped in Massachusetts under the compulsory automobile insurance law. Owners of trucks guilty of such violations face loss of registration and operators are arrested for driving trucks that are not properly insured. The extent of the use of trucks for service of this kind is surprising.

Millbury, Mass.—Town officials and officers of the Worcester Consolidated Street Railway are endeavoring to reach an agreement on the fare to be charged by the buses which are to supplant the trolleys early in July.

Dayton, Ohio.—The Dayton & Troy Electric Railway has asked the State Supreme Court to require the Utilities Commission to revoke the certificate of the Inter-City Coach Company on the ground of alleged improper practices.

Troy, N. Y.—Consent of the Public Service Commission to abandon certain portions of its lines in Troy was asked on June 20 by the United Traction Company. Officials of the company have voted to substitute buses, a certificate for the operation of which is also asked of the commission. A hearing on the petition will be held later.

Fitchburg, Mass.—The Fitchburg & Leominster Street Railway has asked the State Department of Public Utilities to restrict the Suburban Bus Lines Company, Inc., from operating in Fitchburg and Lunenburg. It is said that of late the bus line has been picking up and letting off passengers within the limits of Fitchburg and that it is running special trips to Whalom Park, operated by the railway, in direct competition with the railway. The bus company claims it has been serving Lunenburg more adequately than the railway did before it abandoned its route. The management said it would put a stop to the handling of local business in Fitchburg by its operators in contravention of the rights of the railway there.

Dover, N. J.—A portion of the Morris County bus line, route 72, operating between Newark, Morristown, Dover, and Netcong, has been extended by Public Service Co-ordinated Transport from Netcong to Budd Lake and Hackettstown. Over the route between Newark and Dover the Morris County Traction Company formerly operated, but the service of that company was replaced by buses of the Public Service some time ago.

St. Louis, Mo.—Eight windows were broken and a parked automobile damaged when the fan-belt of a bus of the St. Louis Public Service Company broke and threw parts of the broken blades on both sides of the street on June 16. Recently a similar mishap occurred to a bus of the People's Motorbus Company. Richard W. Meade, president of the People's company, said that the two cases in St. Lonis were the first of the kind to his knowledge, although buses in his charge have traveled many million miles.

Financial and Corporate

Key System to Reorganize

Two distinct corporations may result from plans under consideration. Committee working out details

ANNOUNCEMENT has been made by A. J. Lundberg, president, Key System Transit Company, Oakland, Cal., that the company will default interest payments due on July 1, on its first mortgage, general and refunding mortgage bettle and on unters of the Key. gage bonds, and on notes of the Key System Securities Company. Mr. Lundberg admitted this is the initial step in a program of reorganization in which the company's capital structure will be changed and a new plan of operation followed, but stated he could not discuss details at this time.

The company has been able to pay interest by rigid operating economies, sale of non-operating properties and use of funds from its depreciation account and could have continued to meet its obligations in this manner for some time to come. However, the directors felt that serious deterioration of the property eventually would result from this pro-cess and, as the day of reckoning in-evitably would arrive, decided upon ac-

tion at the present time.

At a conference held on June 22 with members of the California Railroad Commission it is understood that Key System officials submitted a plan to separate into two distinct corporations, the System's East Bay street car division and its transbay ferry and interurban division. It is also understood that the commission asked for additional data on the company's plans, but pointed out that it could render no decision without a public hearing.

The transbay division has shown a 4½ per cent return on the investment, but the deficit of the street car division annually has been so high that it more than offset the profits from the ferry and interurban service. President Lundberg has stated that stockholders will not be asked to invest further capital in any branch of the company which is not able to show a return on the money invested, so it is thought probable that they will be asked to advance additional capital for the building up of the former division but will not be asked to sink any further capital in the latter.

With new money thus derived from stockholders and from the probable sale of valuable real estate which the company owns, together with advantages arising from changes in capital structure, it is pointed out that if the proposed segregation of the properties is permitted, the company taking over the transbay ferry division would be in a sound financial position. On the other hand, the condition of the street car division is so unsatisfactory that its ultimate fate is extremely doubtful. It is pointed out that on many occasions the railroad commission has urged that the Key System and Southern Pacific work out an agreement which would abolish present duplication of lines. This now may be accomplished. There are also rumors to the effect that the South-ern Pacific or Western Pacific may buy the Ferry-Interurban system, and others

that the Key System may abandon the street car lines.

Details for perfecting the plans for changes are in the hands of a committee of which C. O. G. Miller, president of the Pacific Lighting Corporation and chairman of the board of the Key System, is chairman.

Public Financing by Stone & Webster

Stone & Webster, Inc., will shortly add \$57,500,000 of capital funds through public financing. The business will continue under the same management with added advantages of a substantial public ownership.

The present Massachusetts corporation will be dissolved and a Delaware corporawith the dissolved and a Delaware corporation formed with the same name. The authorized capitalization of the new corporation will consist of 1,500,000 no-par shares of capital stock, of which 400,000 shares will shortly be offered at \$100 a share. The present large stockholders are at the same time increasing their interest to the extent of \$17,500,000, or 175,000 new shares. There will be outstanding altogether approximately 1,300,000 shares of stock. The management expects to list its shares in New York.

The board of directors will be enlarged to include W. Cameron Forbes, former grovernor grant of the Philipping

governor general of the Philippines; Joseph P. Grace, chairman of W. R. Grace & Company; Herbert L. Pratt, chairman Philippines; governor of Standard Oil Company of New York; Eliot Wadsworth, former assistant secretary of the Treasury; Albert H. Wiggin, chairman of Chase National Bank.

Wrongly Directed Municipal Ownership Efforts

Constant agitation for public ownership is a matter which receives substantial comment in the recent interim report of the committee on public service company securities of the Investment Bankers' Association approved by the board of govern-ors at White Sulphur Springs. In the words of the report:

"There is never-ceasing propaganda for public ownership and operation and for the extension of the legal rights and jurisdiction of the municipal corporations. Many thoughtful people are lured by the idea of public ownership as a wise method of curbing disliked practices of private ownership."

The committee feels, however, that such efforts are wrongly directed, and despite examples of sporadic success, are based on misinformation and misconception of the inherent nature of the businesses attacked and of the nature of our government.

Chicago, Ill.—A committee consisting of George Woodruff, vice-chairman of the National Bank of the Republic, Joshua D'Esposito, chief engineer for the Union Station Company, and Col. A. A. Sprague, vice-chairman of the Citizens' Traction settlement committee, will be named by the city to pass on the valuation of the elevated lines under the proposed plan for unification.

City Controller Scores P.R.T.

Questions many items of expense in preliminary report on affairs of railway. Full audit promised later

CONTROLLER HADLEY of Philadelphia on June 20 transmitted to City Council the preliminary report of the audit of the accounts of the Philadelphia Rapid Transit Company. The Controller demanded of Council a special investigating committee to look into the whole subject of P. R. T. expenses over the five-year period to June 30, 1928, covered by the The Controller also transmitted a special report of Dr. Milo R. Maltbie, who is aiding him in the audit. The Controller promises a more definite and exhaustive report by Dr. Maltbie, but stated the audit could not be completed for at least three more months.

Fourteen leading points thus far developed by the audit demand special investigaoped by the audit definant special investiga-tion, City Controller Hadley informed City Council, asking for a special councilmanic committee of inquiry to go into them. They have been summarized in part as

follows:

1. Control of the majority of stock of the P. R. T. Company and how acquired by Mitten Management.

2. Payment of management fees of \$6,to Mitten Management in addition to \$19,108,538 paid to general officers of the P. R. T. Company for salaries and expenses of mmanagement as well as directors' fees amounting to \$96,540.

- 3. Commitment of the P. R. T. Company to a 30-year lease for offices in the Mitten Building at a rental of \$400,000 a year for the first ten years and \$500,000 a year for the next twenty years, in addition to the payment of taxes, assessments, repairs, etc., for the entire building by the P. R. T. Company. The P. R. T. sublets to Mitten Management a portion of the building for an amount less than the cost of the P. R. T.
- 4. Payment of \$25,000 for cancellation of lease covering a portion of the corner of the first floor of Mitten Building.
- 5. The purchase of the Yellow Cab Company at more than \$500 a share for no par value stock.
- 6. The operation by the P. R. T. Company of the Quaker City Cab Company, notwithstanding the fact that the Public Service Commission has failed to approve the acquisition of the cab company.

7. The borrowing by Mitten Management of P. R. T. funds to the extent of \$15,556,050, for which less than 3 per cent was paid to P. R. T. Company.

8. Payment to J. W. Braun of \$621,794 and the purposes for which this money was

9. The question of gratuities, donations, subscriptions, etc., amounting during the auditing period to \$53,125; expenses of the Co-operative Committeemen trip to Buffalo, \$18,009; show at Buffalo—"Little Nellie Kelly," \$13,411.

10. Loss resulting from sale of newspapers on street cars-\$25,992.

11. Expenditures for legal services, including two or more individual payments of \$50,000 each, which will appear in a subsequent report.

12. Damage claims settled with attorneys.

13. Services rendered by experts and fees paid for valuations made, and many other items of expenditure listed by Haskins

14. The alleged practice of employing city officials and former city officials by the P. R. T. Company.

Des Moines System Sold

Walter J. Cummings and associates of Chicago purchase road in Iowa city under foreclosure

SYNDICATE headed by Walter I. A SYNDICATE headed by Walter J. Cummings, Chicago, was the only bidder for the property of the Des Moines City Railway at the public auction held on June 22, at Des Moines, Ia.

E. J. Kelly, special master, who conducted the sale, has recommended to the

federal district court that Mr. Cummings bid of \$1,855,000 be approved, and it is expected that Judge Martin J. Wade will give his approval just as soon as a sufficient time has elapsed to allow creditors to file possible objections.

Associated with Mr. Cummings in the purchase were Charles H. Wilcox, president of the General Steel Company, Chicago, and Charles G. Adsit, former vicepresident of the Georgia Power Company,

Atlanta, Ga.

The Des Moines City Railway had heen in receivership since Nov. 12, 1926, when Federal District Judge Martin J. Wade granted the application of the Harris Trust & Savings Bank, Chicago, which filed a & Savings Bank, Chicago, which filed a petition on Nov. 11, setting forth that the company was in default on the principal payment on \$700,000 of debenture bonds. Clyde E. Herring, Des Moines business man, and F. C. Chambers, former manager of the railway, were named receivers.

After the receivers filed a report announcing that they had on hand \$118,000 to pay indebtedness of \$1,759,152, Judge Wade

ordered the property sold.

Prior to the sale, Mr. Cummings announced that he had purchased the debenture bonds and notes held by the Harris interests, constituting the principal indebtedness of the company, outside of first mortgage bonds totaling \$5,762,000.

The 103 miles of tracks, overhead, carhouses, automatic substations and rolling stock of the railway are valued at approx-

imately \$10,000,000.

Mr. Cummings made public plans for the immediate shipment of ten late model street cars to Des Moines, and announced service betterments which include more crosstown buses, and more bus feeders for the railway system.

The car strike which threatened over the famous two-man car contract signed between the union and the company back in 1915 appeared rather remote when Mr. Cummings pointed out that he is using nothing but two-man cars on his lines around Chicago, and that the ten new cars promised to Des Moines all require twoman operation.

Mr. Cummings purchased the car system without the inclusion of the two-man car agreement which was to run till 1940, but gave no indication that he will attempt to institute one-man car service in Des Moines. He also indicated he did not intend to alter the 10-cent single fare or the weekly pass which sells for \$1.25 and is good for an unlimited number of rides for seven days

Mr. Cummings is president of the Chicago & West Towns Railway, and president of the Cummings Car & Coach Com-

4,444 Exhibits in Trade Commission's Inquiry

Field accounting work has begun on two large operating subsidiaries of two important holding companies in connection with the investigation which the Federal Trade Commission is making of public utilities in pursuance of a Senate resolution.

Conspectus of Indexes for June, 1929

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY Electric Rallway Engineer, Worcester, Mass.

		Month	Year	Last 5 Years	
	Latest	Ago	Ago	High	Low
Street Railway Fares* 1913 = 4.84	June	May	June	June	Jan.
	1929	1929	1928	1929	1924
	7.76	7.76	7.62	7.76	6.91
Materials* 1913 = 100	June	May	June	March	Feb.
	1929	1929	1928	1924	1928
	145,8	145.5	141,4	163.9	139.5
Electric Ballway Wages* 1913 = 100	June	May	June	June	Jan.
	1929	1929	1928	1929	1924
	230.8	230.1	229.2	230.8	217.4
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	June	May-	June	March	Sept.
	1929	1929	1928	1924	1927
	193.7	199,5	202.7	206.8	199.4
Eng. News-Record Construction Cost (General) 1913 = 100	June	May	June	March	Nov.
	1929	1929	1928	1924	1927
	205.6	205.2	206.2	224.7	202.0
U.S. Bur. Lab. Stat.	May	April	May	Nov.	April
Wholesale Commod-	1929	1929	1928	1925	1927
ities 1926 = 100	95.8	90.8	98.6	104.5	93.7
Bradstreet Whelesale Commodities 1913 = 9, 21	June	May	Jane	Dec.	July
	1929	1929	1928	1925	1924
	12.46	12.68	13.19	14,41	12,23
U. S. Bur. Lab. Stat.	May	April	May	Nov.	May
Retail Food	1929	1929	1928	1925	1924
1913 = 100	153.3	151.6	153.8	167.1	141.0
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	May	April	May	Nev.	April
	1929	1929	1928	1925	1929
	159.4	159, 3	161,5	171.8	159.3
Industrial Activity Elec.World—Kwhr. used 1923-25 = 100	May	April	May	Feb.	July
	1929	1929	1928	1929	1924
	136.9	136.4	119.0	140.4	73.4
Bank Clearings Outside N. Y. City 1926 = 100	May	April	May	Feb.	May
	1929	1929	1928	1929	1924
	102.5	104.0	108,4	110.1	84.4
Business Fallures Number Liabilities (Millions)	May	April	May	Jan.	Sept.
	1929	1929	1928	1924	1928
	1733	1738	1723	2231	1348
	44.90	32.59	36.82	122, 95	23,13

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

Summaries are almost completed on the growth of capital assets and capital liabilities, on issuance and purchase of securities and on service fees for six holding and service companies.

Field work has been started on relations between utility companies and service organizations in the offices of four management groups, while the preparation of all information available on intercorporate relationships in general, is nearing completion.

The foregoing material will be used in preparation for public hearings on the financial phase of the utilities investigation.

The total number of exhibits introduced is now 4,444.

On June 27 it was announced the inquiry had been adjourned till September:

Detroit, Mich. - The United States government will seek to collect \$300,000 from the Detroit United Railway, the predecessor of the present Eastern Michigan Railways, in respect of profit and income taxes for 1918 and 1920.

Tacoma, Wash.-According to Commissioner Ira S. Davison, gross receipts of the municipal belt line were \$10,453 in April and net profit \$2,063. This pulled the line out of the "red" for the year to date, and left a balance of \$341 to its credit.

Indianapolis, Ind.—Merger plans contemplate that all the interurban properties owned and leased by the Terre Haute, Indianapolis & Eastern Traction Company shall be put into a corporation to be known as the Indiana Rapid Transit Company, neither the securities nor carnings of which will be guaranteed by the Indiana Electric Corporation, which would own all common stock. It is entirely probable that the Central Indiana Power Company properties and the light and power business of the railway will be consolidated in the main corporation, while the railways will be left on their own revenue-earning ability.

Oakland, Cal. — The Key System Transit Company has applied to the Railroad Commission for permission to abandon its street car line now operating between East Fourteenth Street and the plant of the Pacific Tank & Pipe Company in East Oakland.

St. Louis, Mo .- During April the number of revenue passengers hauled by the People's Motorbus Company in-creased 8.45 per cent compared with April, 1928, while revenue street and bus passengers of the St. Louis Public Service Company dropped 5.24 per cent.

Springfield, Mass .- Recent reports of the Springfield Street Railway show an appreciable decline in the number of passengers carried. The report for April, 1929, shows 2,924,343 revenue passengers, as against 2,951,664 in April, 1928. Transfer passengers were 379,575, as against 379,172 in April of last year. The company recently reiterated its adherence to the policy of replacing trolleys by buses in suburban service where economic condition warrant the charge.

Denver, Colo.—Group insurance aggregating \$1,250,000 recently was taken out for its employees by the Denver Transway. No employee less than nine months with the company is eligible to the \$1,000 to \$1,200 coverage. The average monthly premium is 60 cents per individual, the company defraying the remaining cost. The contracts were remaining cost. The contracts were signed by 95 per cent of the men who are eligible.

Personal Items

C. E. Morgan With West Penn

Executive of Brooklyn City Railroad joins vast railway system radiating from Connellsville as vice-president

DYNASTIES, whether political or industrial, to be successful, must be directed by men of action. It is, of course, always interesting to inquire into the economic consequences of countries and corporations, but to the great majority of us Mussolini means more at the moment than does Italy and John D. Rockefeller means more than does Standard Oil. In contrasts of this kind in electric railroading Clinton E. Morgan means more at the moment than does the Brooklyn City Railroad. So this industry will pause at the news that Mr. Morgan, inseparately a part of the Brooklyn City Railroad since 1919,



C. E. Morgan

is to become vice-president of the West Penn Railways, Pittsburgh, Pa.

Mr. Morgan's work as doctor of the sick system of lines of the Brooklyn City Railroad has ended. He has done well with the job for which he was originally retained. He goes to Pittsburgh on the eve of the merger of the lines of the Brooklyn City with those of the surface lines of the Brooklyn-Manhattan Transit Corporation. Certainly, if he made no promises when he assumed the job in Brooklyn Mr. Morgan need make no excuses now.

Previous to October, 1919, the Brooklyn

Previous to October, 1919, the Brooklyn City Railroad was operated as part of the property of the Brooklyn Rapid Transit Company, the predecessor of the Brooklyn-Manhattan Transit Corporation. Mr. Morgan was placed in charge as assistant general manager, then served as general manager and latterly as vice-president and general manager. He came from the West with a long record of accomplishments and crowned his work with a record for rehabilitation and vigorous management in Brooklyn that has greatly enhanced his reputation.

Mr. Morgan began railroading as a clerk in the office of a steam railroad. For the next five years he acted as assistant to the president and other officers of the Indianapolis & Greenfield Electric Railway. In 1905 he had charge of the work of the rehuilding and operating the Indianapolis line, and was also superintendent

of the Danville line of the Terre Haute, Indianapolis & Eastern Traction Company. Four years later he accepted the position of general manager of the Indianapolis, Crawfordsville & Western Traction Company. He resigned in 1912 to become connected with the Michigan Railway.

To say that Mr. Morgan has been active in the affairs of the American Electric Railway Association hardly characterizes his work properly. He has been more than active. He is a charter member of the Central Electric Railway Association and in the past has served as a member of the standardization committee on equipment in both the Central Electric Railway and the American Association. Also he was a member, and later chairman of both the schedule and time tables and the rules committees of the Transportation and Traffic Association. He also served on the block signal committee. Mr. Morgan now is the chairman of the committee on publications of the American Association and is the third vice-president of that body.

Ray P. Stevens Heads New Power Merger

Details of the merger offer by which J. P. Morgan & Company and F. L. Carlisle & Company hope to weld together a \$565,000,000 power combine in upper New York State have been made public. Niagrara-Hudson Power Corporation is the name of the new concern, and it has offered, by exchange of its shares, to acquire the Buffalo, Niagara & Eastern Power Corporation, the Northeastern Power Corporation and the Mohawk-Hudson Power Corporation, together with their many subsidiaries.

their many subsidiaries.
Floyd L. Carlisle is chairman of the board of directors; George H. Howard, president of the United Corporation, is chairman of the executive committee; Ray P. Stevens, former president of the Allied Power & Light Company, will be president.

Power & Light Company, will be president.

The vice-presidents are Alfred H.
Schoellkopf, vice-president and general manager of Buffalo, Niagara & Eastern, and E. L. West, also of the same concern.

H. L. Reichart Vice-President, New York State Railways

At the meeting of the directors of the New York State Railways following the recent change of control from E. L. Phillips and associates to that of the Associated Gas & Electric interests, Howard L. Reichart, secretary and treasurer of the New York State Railways, was elected a director and vice-president of the company.

Mew fork state Railways, was elected a director and vice-president of the company.

Mr. Reichart has been connected with the New York State Railways since its incorporation, and was formerly associated with the late Horace D. Andrews when the latter was president of the New York State Railways and the Rochester Railway & Light Company with offices in New York City. Mr. Reichart went to Rochester when the general offices were moved there in 1918. He was appointed assistant secretary of the New York State Railways in 1913, and in April, 1925, he was elected secretary and treasurer of the company.

C. H. Dahl Heads Canadians

Assistant general manager at Winnipeg was elected president at recent Montreal meeting

H. DAHL, assistant general manager of the Winnipeg Electric Company, Winnipeg, Man., in charge of operation, was elected president of the Canadian Electric Railway Association at the recent meeting in Montreal. His work at Winnipeg covers the responsibility for the operation of the transportation service, the electric and the gas utilities.

The new president of the Canadians was educated in the public and the high schools of Marinette, Wis., the Normal School at Oshkosh, Wis., and the University of Wisconsin. From the last named institution he holds a B.A. degree.

Mr. Dahl taught school for seven years previous to his collegiate training. He joined the Wisconsin Railroad Commission in 1917 as case investigator, and held that position until November, 1919, when he became connected with the



C. H. Dahi

Winnipeg Electric Company as statistician. A statistician is in a position to take in the full measure of the operations of a company if he will, and this is just what Mr. Dahl did.

During his four years of almost silent work in that capacity he made himself one of the best informed men in the company's service, so that when in May, 1923, he was appointed assistant to the vice-president, Mr. Dahl, if he didn't know all about the company, knew a great deal. Incidentally, he had learned much about other Canadian utilities since statistics are the measure by which one company is compared with another in the matter of performance. In November, 1923, Mr. Dahl was appointed assistant to the operating manager, and from that post was advanced to assistant general manager in charge of operations. This was in December, 1924.

B. C. Cobb Heads Penn-Ohio Edison

B. C. Cobb has been elected president of the Penn-Ohio Edison Company to succeed R. P. Stevens, who resigned to become president of Niagara-Hudson Power Corporation. Other officers elected were T. A. Kenney, vice-president; H. G. Kessler, controller, and E. E. Nelson, secretary.

F. A. Merrick Westinghouse President

E. M. Herr, president since 1911, elected vice-chairman. vacation after long intensive service. New president was formerly vice-president and general manager

F. A. MERRICK was elected president of the Westinghouse Electric Manufacturing Company by the directors on June 26. In announcing the election A. W. Robertson, chairman, stated that directors, while accepting the resignation of E. M. Herr, president since 1911, in order that he might go on an extended vacation, had elected

Mr. Herr vice-chairman.

Mr. Merrick advances to president from the position of vice-president and general manager. He is a native of New Jersey and received his technical education at Lehigh University. Shortly after his graduation, he was employed by the Steel Motors Company, a sub-sidiary of the Lorain Steel Company, where he was responsible for many important electrical inventions and where he held the position of manager

and chief engineer.

On the acquisition of the Steel Motors Company by the Westinghouse Company, Mr. Merrick entered the Westinghouse organization. He was immediately selected to prepare plans for a plant in Canada, and, in 1903, upon the formation of the Canadian Westingthe formation of the Canadian Westinghouse Company, Ltd., was sent to the Dominion as superintendent of the company. In turn he became manager of works and later vice-president and general manager of Canadian Westinghouse Company, Ltd.

In the World War emergency, Mr. Merrick was assigned to organize the operations of the New England Westinghouse Company, to manufacture rifles for the Russian government. When

rifles for the Russian government. When the United States entered the war, further demands were made upon plant for American war material.

From \$20,000,000 Sales to \$200,000,000 UNDER MR. HERR

The achievements of Mr. Merrick before, during, and following the World War won for him in January, 1925, the position of vice-president and general manager of the Westinghouse Electric & Manufacturing Company, with head-quarters in East Pittsburgh, Pa. In June, 1925, he was also elected a director of the company. Mr. Merrick will make his headquarters in Pittsburgh.

During Mr. Herr's management the

During Mr. Herr's management, the Westinghouse Company grew from a business with \$20,000,000 sales annually to one with an annual business of approximately \$200,000,000. The period of his connection with the company dates from 1905 when he resigned from the Westinghouse Air Brake Company to become first vice-president of the electric company. When the Westinghouse Electric was forced into a receivership in 1907, Mr. Herr was appointed one of the receivers and also general manager. The reorganization was successfully completed within a little more than a year and Mr. Herr resumed his former position with the company. In 1911 he

was elected president.

After he was graduated from the Sheffield Scientific School at Yale University in 1884 with the degree of Ph.B. Mr. Herr entered the office of the mechanical engineer of the Chicago, Burlington &



F. A. Merrick

Quincy Railroad at Aurora, Ill., as a mechanical draftsman and through successive promotions became engineer of tests, superintendent of telegraphs, and finally division superintendent of that road. In 1891 he became division master mechanic of the Chicago, Milwankec & St. Paul Railroad. Two years later he accepted the position of general superintendent of the Grant Locomotive Works in Chicago and in 1894 became general manager of the Gibbs Electric Company of Milwaukee. In 1898 he was asked by George West-

inghouse to accept the position of general manager of the Westinghouse Air Brake Company, located at Wilmerding, Pa. Mr. Herr remained with this company until 1905 when, as before mentioned, he was elected first vice-president of the Westinghouse Electric Company.

Despite the exacting demands made upon his time as an official of the Westinghouse Company, Mr. Herr retained his deep interest in educational matters. It was he, perhaps, who helped most to develop the educational system for the employees of the Westinghouse Company. In 1920 he was elected a member of Yale Corporation and later was appointed to the Prudential Committee, which is charged with all financial matters connected with that University. He was also made a member of the Corporation's committee



E. M. Herr

educational policy, on which committee he has assisted in formulating the educational policy of the university and particularly that of the Sheffield Scientific School. If Mr. Herr has a hobby, it is etchings. Greatly interested in the graphic arts, he has one of the finest collections of Cameron prints in the United States. Mr. Herr was born at Lancaster, Pa., on May 3, 1860.

William Orem, Promoted by Salt Lake & Utah

C. H. Simpson, district freight agent of the Salt Lake & Utah Railroad, Salt Lake City, Utah, has resigned to become affiliated with the Pacific Nash Motors Company, San Francisco. William Orem, general agent, will take over the duties of Mr. Simpson, who has been with the railroad for six years. H. J. Stagg, Provo, Utah, traveling freight and passenger agent, has been appointed commercial agent with headquarters at Salt Lake City, and J. J. Sutherland, agent at Provo, has been promoted to succeed Mr. Stagg.

Commissioner McCardle Reappointed in Indiana

Reappointment of John W. McCardle and the appointment of Jere West, Crawfordsville, Ind., as members of the Indiana Public Service Comission have been announced by Governor Harry G. Leslie. Mr. West will succeed Harvey Harmon, Princeton, as a democratic member of the commission. At a reorganization meeting Mr. McCardle was elected chairman to succeed Frank T. Singleton of Martinsville. Mr. McCardle's appointment marks the beginning of his thirteenth year as a member of the commission. He was chairman from 1921 to 1926. Mr. West retired from the Circuit Court at Crawfordsville on Jan. 1.

H. Hobart Porter Heads Music Publishing House

At the postponed annual meeting of the Oliver Ditson Company, music publishers, held in Boston, the directors elected H. Hobart Porter, well known in the utility field, president, to succeed Charles H. Ditson, recently deceased. Mr. Porter announced that he would continue the basic policies inaugurated by Oliver Ditson, when he founded the business in 1835.

W. S. Robertson has resigned from the post of president and general manthe post of president and general manager of the Minnesota Power & Light Company, Duluth, Minn., to become associated with the American & Foreign Power Company, a subsidiary of the Electric Bond & Share Company. He was president and general manager of the Duluth company for six years. It is expected that Mr. Robertson will go to China to take charge of the firm's interest in the Far East.

J. Fred Hull was sworn in June 4 as a member of the Missouri Public Service Commission. He has been appointed for a six-year term to end on April 15, 1935. He succeeds J. P. Painter. Until a few days ago Mr. Hull was postmaster for Maryville. Before that he was editorof a newspaper there.

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"For the Love of Mike!"

Pittsburgh honors J. M. Loftis, who has done so much there in the interest of safety

A MERICANS tell the Chinese that their custom of putting food on an ancestor's grave is absurd because dead men cannot eat. The Chinese, in turn, ask the Americans why they put flowers on the graves of their departed since dead men cannot smell.

There can be no doubt that it is a fine thing to give bouquets to living friends. And that is exactly what the Pittsburgh trainmen did when they set aside the week of May 26-June 1, 1929, as "Safety Week" as a testimonial of their respect and admiration for J. M. Loftis, superintendent of transportation of the Pittsburgh Railways.

Quite appropriately, the slogan adopted for the campaign was, "For the Love of 'Mike,' be careful." During the campaign, which was sponsored by the company's bureau of accident prevention, all of the trainmen, as well as many employees from other departments of the company, wore lapel hut-



J. M. Loftis

tons bearing the photograph of Mr. Loftis, better known as "Mike."
Mr. Loftis went to Pittsburgh forty

years ago from Randolph County, West Virginia, at the age of 21. Since he had had about a year's experience as motor-man and conductor at Wheeling, his first thought upon arriving in Pittsburgh was to connect with one of the local railways. Consequently, he applied for and secured a job with the Citizens' Traction Company, October 9, 1889, as laborer. A year later he was made night watchman and night receiver at the East Liberty Depot. After more than two years at this place, Mike asked for an outside job as gripman on the road so that he might work "on the road so that he might work "on the outside." Several years later, when the Citizens' Traction Company was taken over by the Consolidated Traction Company, Mr. Loftis was made a motorman and for a period of one year operated out of the Homewood carhouse, as it was called at that time. Promotions followed in rapid succession for Mike after that.

In May, 1898, he was appointed in-pector; in September, 1899, he was spector; made division superintendent in charge of the Butler Street division; in May, 1904, he was again transferred to Homewood, this time as division superintendent; and in 1910 he was appointed superintendent of the entire system between

the Allegheny and Monongahela Rivers except the Second Avenue lines.

In January, 1913, Mr. Loftis was promoted to the office of assistant to M. J. Maxwell, superintendent of transportation of the Pittsburgh Railways, and in July of the same year, following the death of Mr. Maxwell, he was appointed superintendent. From that time until the present, 16 years, Mr. Loftis has successfully carried out the duties of this office, and through the conscientious and faithful performance of his work, holds the high esteem of all who know him.

He has been a tireless and active worker for safety in the company ever since concentrated efforts in this direction were started by C. G. Rice, head of the company's claim department, twenty years ago.

C. J. Crampton Became Secretary of Dallas Commerce Chamber

C. J. Crampton, in charge of the public relations department of the Dallas Railway & Terminal Company, Dallas, Tex., has been elected executive secretary of the Dallas Chamber of Commerce. He assumed his new duties Mr. Crampton has been with July 1. Mr. Crampton has been with the Dallas company for ten years. During this time he has done much to promote safety on the company's lines as well as to foster a closer personal relationship between the employees and the employers. In addition to being in charge of public relations he has been superintendent of the safety department of the railway, a department which he originated. He also founded Partners, originated. He also founded Partners, the company weekly publication, an important organ which affords an outlet for commons, suggestions and personal comment for the railway's employees. Mrs. Corita C. Owen, who has been secretary to Mr. Crampton, will continue as editor of Partners.

Dr. Philip Kremer, long connected with the street railway system in Berlin, Germany, latterly as assistant to the general manager, will on July 1 become manager of the street railway and bus system of Frankfort-on-Main. Dr. Kremer is known to many American electric railway men. He made an extended trip in this country last sninmer, so arranged that he attended the convention of the American Electric Railway Association in Cleveland.

Howard P. Savage, general manager of the Metropolitan Motor Coach Company (Marigold Lines) Chicago, Ill., has been appointed a colonel on the personal staff of Governor Louis L. Emmerson of Illinois. Mr. Savage is past national commander of the American Legion, and previous to becoming general manager of the Metropolitan system he was assistant general manager of the Chicago, North Shore & Milwaukee Railroad.

George I. Wright, engineer of electric traction of the Reading Railroad, with headquarters in the Reading Terminal, Philadelphia, Pa., has just returned from a six-weeks' trip to Europe. While abroad he visited nine countries, making a study of railroad electrifica-tions in connection with the pending developments of the Reading.

W. H. McCarty Heads Middle Atlantic Equipment Men

W. H. McCarty, elected president of the Middle Atlantic States Association of Railway Equipment Men recently, has been connected with the Capital Traction Company, Washington, D. C., and its predecessors since 1895. Since 1912 he has been master mechanic of the company and at present has charge of the maintenance of car, bus, and automotive equipment, in which work he has made a notable record.

Mr. McCarty went to the company at Washington unusually well-equipped in practical training since he had served a rigid apprenticeship with the American Bridge & Iron Company in the machine division. There he underwent the sturdy course of training in his profession which starts with a rat-tail file being placed in the hands of the apprentice and is concluded only after the novice has run the gamut of all the various kinds of work there is to do around the shop.

Not content, however, with this training, Mr. McCarty sought further experience and gained it as an employee of the locomotive shops of the Norfolk & Western



W. H. McCarty

Railroad at Roanoke, Va. Here again, this time for a period of two years, he had a hand in all the various classes of work that passed through the locomotive shops. was from this service that he passed to the Washington & Georgetown Railroad and its successors, with which his career has carried him to eminence in the field of maintenance work and won respect for his opinion upon things mechanical not only in his own company but among his fellow This is well instanced, perhaps, craftsmen. by his notable association work as a member of the special committee No. 6 of the rolling stock division of the American Engineering Association, his many other association activities and in his very recent election to head the Middle Atlantic Association at the Wilmington meeting. Mr. McCarty is a native of Virginia.

William G. Marshall, since 1926 director of personnel for the Philadelphia Company and affiliated corporations, has been appointed assistant to Vice-president T. P. Gaylord of the Westinghouse Electric & Manufacturing Comnonse Electric & Manufacturing Company. Mr. Marshall will be in charge of employees' relations, but no change is contemplated in the existing positions of director of personnel or manager of employees' service.

Transportation Engineering Department for G. E.

H. L. Andrews Named Engineer, W. B. Potter, Consulting Engineer, and A. H. Armstrong and W. J. Davis, Jr., Associate and Consulting Engineers

REORGANIZATION of the railway engineering department of the General Electric Company and its future designa-Electric Company and its runnic tion as the transportation engineering de-Allen, vice-president of engineering. H. L. Andrews is named engineer of the department; W. B. Potter is appointed consulting engineer with A. H. Armstrong and W. J. Davis, Jr., as associates and consulting engineers. Included in and as divisions of the transportation engineering department will be the railway equipment, the air brake equipment, and the industrial locomotive engineering departments at the Erie, Pa., Works, and the automotive engineering department at the Lynn, Mass., River Works.

Mr. Andrews, engineer of the new de-

Among the projects which have engaged the attention of Mr. Potter were the Manhattan Elevated Railway, Baltimore & Ohio electrification, Paris-Orleans electrification, New York Central terminal electrification, West Jersey & Scashore Railroad and later, the Detroit Tunnel, Great Northern and Southern Pacific lines. Later, work such as that on the Butte, Anaconda & Pacific, Chicago, Milwaukee & St. Paul, and the Victorian Railways was carried out under his general supervision.

More than 130 patents have been issued to Mr. Potter for various inventions, including the series-parallel controller, the surface contact system, the three-wire system of railway operation, electro-pneumatically contact control system, and the otheograph. Other patents relate to electric switching, motors, generators, third rail, electric braking, air brakes, and various schemes of motor control.

Albert Horace Armstrong was graduated from Worcester Polytechnic Institute in the engineering course in 1891 and entered the employ of the Thomson-Houston Company at Lynn in the same year. In 1897, he entered the railway engineering department

New Counsel for New York Board

Denis R. O'Brien has been named by the Board of Transportation of New York City as counsel to succeed William G. Fullen, who resigned in August and was later appointed to head the Transit Commission. Mr. O'Brien has been assistant corporation counsel, in charge of the contract bureau, since 1926. He has aided the Board of Transportation in the past few months in the preparation of city contracts for subway cars, power supply and signal equipment. As head of the contract bureau of the Corporation Counsel's office he has passed upon city construction contracts and handled contract litigation.

Edward F. Kelley, secretary of the Louisville Kiwanis Club and secretary to James P. Barnes, president of the Louisville Railway, Louisville, Ky., has been named chairman of the Secretaries' Conference of International Kiwanis Clubs. It is the first time in the history of the organization that the Kentucky-Tennes-see Kiwanis district has received such



H. L. Andrews



W. B. Potter



A. H. Armstrong



partment, was graduated from the University of Missouri in 1910 with the degree of B.S. in electrical engineering. In August of that year, he entered the testing department of the Schenectady Works of the General Electric Company and was made General Electric Company and was made assistant head of the floor test the following year. In May, 1912, he was transferred to the railway motor department, and, in 1916, joined the railway engineering department. A year later he was placed in charge of car equipment. Late in 1925, he was appointed assistant engineer in administrative charge of the

department. W. B. Potter is a native of Connecticut. Upon leaving school he began service as a machinist apprentice with Sawtele & Judd, Hartford, Conn. Foreseeing the future of the electrical industry, he secured employment with the Thomson-Houston Company at Lynn, Mass., in June, 1887. He became interested in electric railways through reports of Frank J. Sprague's work and decided to follow electric rail-

roading. In connection with a study of electric railway equipment, in 1892, Mr. Potter conceived the series-parallel controller, since used almost universally in control for electrie railway motors. Mr. Potter continued in the department with the absorption of the Thomson-Houston Company by General Electric and, in 1895, was made chief engineer.

and has since devoted most of his time to the study of railway problems. One of his most important earlier studies was that of train acceleration.

In addition to an extensive study of interurban and heavy traction work, Mr. Armstrong has taken part in the engineerroad electrifications. For many years he has held the position of assistant engineer of the railway engineering department, and chairman of the electrification committee of the company. He is the author of a section of the standard handbook on the subject of railways and also of numerous papers which have been delivered before various

technical societies.

W. J. Davis, Jr., is a graduate of the Rose Polytechnic Institute. He began his work with the General Electric Company in the testing department upon graduation in 1892. After completing several of the regular tests, he was placed in charge of the calculating room of the testing department which was just then being organized. His next work was with W. B. Potter, who had then recently been made engineer of the railway department. In connection with his work on heavy electric traction, he introduced forced ventilation for railway motors and made an exhaustive pioneer study of the subject of train resistance. In February, 1921, he was transferred to railway engineering department in Schenectady.

an appointment. The post requires Mr. Kelley to preside over approximately 1,278 secretaries of Kiwanis Clubs.

Frank S. Peters, connected with the Kansas City Public Service Company, Kansas City, Mo., in various capacities since November, 1919, has become gen-eral superintendent of the Kansas City, Merriam & Shawnee Railroad, His first position with the Public Service Company was in the treasury department as a clerk. An experienced transportation man, Mr. Peters was soon transferred to that branch of the service. From the transportation department, Mr. Peters was transferred to the maintenance department and thence to the mechanical department, where he was advanced from a clerkship to the position of assistant to R. S. Neal, assistant superintendent of maintenance.

Sir Thomas White, elected to the board of directors of the Barcelona Traction, Light & Power Company, Ltd., at the annual meeting of shareholders, replaces E. R. Peacock, former president, who has retired from the board due to pressure of other business, brought about by the death of Lord Revelstoke, senior partner.

C. F. Mitchell, vice-president and con-Pittsburgh, Pa., has been elected a director to fill a vacancy caused by the resignation of A. W. Robertson.

Walter H. Burke in Power Field in Northwest

Walter H. Burke has been elected president and general manager of the Minne-sota Power & Light Company, Duluth, Minn. Mr. Burke went to Duluth three months ago from Houston, Tex., as assistant general manager of the local company. Since 1927 until he came to Duluth, Mr. Burke was Southwest district manager of Stone & Webster, with headquarters at Houston. He had been with the company for sixteen years when he resigned to go to Duluth.

For the first time during all his experience in the utility business Mr. Burke will not be confronted by the solution of transportation problems. This, of course, transportation problems. This, of course, is merely a coincidence. From such problems he has never shrunk as his record of accomplishment with Stone & Webster, successful Coffin award contestant both in the light and power and the railway fields.

indicates.

In addition to his post as president of the Minnesota Power & Light Company it is expected that Mr. Burke will be elected executive vice-president of the Superior Water, Light & Power Company in Wiscousin. Both of these companies are included in the system of the American Power & Light Company, under Electric Bond & Share Company supervision.

Mr. Burke was graduated from the University of Maine in 1906 as an electrical engineer, and after several student courses with large power concerns he joined the Stone & Webster firm, going first to Dallas and thence to Milwaukee. In 1914 he was assigned as assistant to the vice-president of the Stone & Webster at the executive offices in Boston, remaining there until 1923. He then served successively as director of the utility operations in Keokuk, Iowa, Houghton, Mich., and Fort Worth, Tex., after which he was appointed as Southwest manager at Houston, in charge of the properties in several states and Mexico. He was born in Portland, Me., in 1884.

J. H. McGraw Doctor of Commercial Science

The degree of Doctor of Commercial Science was bestowed upon James H. Mc-Graw, chairman of the board of the McGraw-Hill Publishing Company, publisher of the ELECTRIC RAILWAY JOURNAL, by the New York University on June 12. Dr. George Alexander, president of the council of the university, in presenting Mr. McGraw, said:

James Herbert McGraw, teacher, publisher of many technical periodicals, broadminded and far-seeing man of business, is presented for the honorary degree of Doctor of Commercial Science."

William H. Nichols, acting chancellor of the university, in conferring the degree upon Mr. McGraw, said:

'Educator transformed into publisher, you have never ceased to be an educator. Your notable career accentuates that tendency in commercial life through which, however private its form, its operations have a public character and become an important element in public education.

"Wherefore, I welcome you to the de-gree of Doctor of Commercial Science, with all the rights and privileges thereunto appertaining, in evidence whereof you will receive this diploma, and be invested with the insignia appropriate to this degree.

Capt. Mark A. Smith, an engineering specialist in aerial and motor coach transportation, has joined the staff of

Ford, Bacon & Davis, Inc. Captain Smith has been identified with the motor coach industry almost from its beginning. He was one of the first to approach the problems of design, production and distribution from the engineering standpoint. He has served as advisory transportation counsel to various state governments and has held many offices and has headed many committees in the Society of Automotive Engineers.

Miss Ella D. Troughton has been appointed assistant treasurer of the New York State Railways. Miss Troughton is only twenty-six years old. She went with the New York State Railways in 1921 from West High School in Rochester where she was an honor student in the business course. In the post of secretary to the secretary and treasurer, her natural ability soon evidenced itself and she was placed in charge of the office force in the secretary's office. Besides being appointed assistant treasurer of the New York State Railways, Miss Troughton has also been appointed assistant treasurer of the United Traction Company and the Schenectady Railway.

R. K. Brown, formerly superintendent and chief engineer, Salt Lake & Utah Railroad, is now superintendent of construction for the Utah Building Commission, recently created by the state legislature.

OBITUARY

Will H. Latta

Will H. Latta, attorney for the Indianapolis Street Railway, Indianapolis, Ind., was killed on June 12, when the auto in which he was driving alone was struck by a southbound Monon train near Carmel at a side road crossing.

Mr. Latta was to have been married on June 17 to Miss Margaret Sander. Fort Wayne, at the Little Church Around the Corner in New York, and had booked passage for a honeymoon trip to Europe on June 19. The Rev. H. C. Stoup, uncle on June 19. The Rev. H. C. Stoup, uncle of Miss Sander, and pastor of the church, was to have performed the ceremony.

Mr. Latta had made his home at the Mr. Latta had made his home at the Claypool Hotel, Indianapolis, for several years. He was born on a farm near Ligonier. After being graduated from DePauw University, he married Miss Carrie Hunt, Coatesville, a student in the university. Mrs. Latta died in February, 1927. 1927. Following his graduation, Mr. Latta taught several years in the university, later entering the law office of Augustus Mason in Indianapolis. About 29 years ago he became associated with the legal staff of the railway. He had served as a member of the board of trustees of DePauw University.

Frederick R. Slater

Frederick R. Slater, vice-president in charge of public relations of the Queens Borough Gas & Electric Company, Far Rockaway, N. Y., died on May 4. At one time Mr. Slater served the Manhattan (Elevated) Railway, New York, as assistant engineer. This was during conversion of the lines from steam to electric operation. Later he became a member of the engineering staff constructing the New York subway and was made principal assistant engineer of the Interborough Rapid Transit Company. For about six years he was with the firm of Latey & Slater,

consulting engineers in the design and installation of electric railway equipment. He was born in Washington, D. C., in 1872.

Charles Finigan

Charles Finigan, superintendent of the Westchester Electric Railroad, Mount Ver-non and New Rochelle, N. Y., and the Westchester Street Transportation Com-

pany, Inc., died recently.

He began his railroad career in 1902 under his father, William Finigan, who was superintendent of the New York City Interurban Railroad, Mount Vernon. Shortly after his father's death, this company was operated by the Union Railway and later by the Westchester Electric Railroad. Mr. Finigan's first work was in the car shops; he also served as foreman in the overhead line department and as operator and starter in the transportation department. He was appointed superintendent of the Westchester Electric Railroad on Dec. 1, 1919, and of the Westchester Street Transportation Company, Inc., on Aug. 29, 1926, when that company became a part of the Third Avenue System.

James P. Boyden

James P. Boyden, since 1905 superintendent of wires for the Boston Elevated Railway, is dead. He entered the employ of the West End Street Railway as a rodman. A short time later he resigned and entered the office of Alixes H. French, civil engineer at Brookline then engaged in engineering work for the town as well as private practice. Subsequently he reentered the employ of the West End Street Railway, later leased to the Boston Elevated. While in the employ of the Elevated. vated. While in the employ of the like vated, Mr. Boyden has been in direct touch vated, Mr. Boyden has been in direct touch with every foot of underground conduit constructed on the system, and as super-intendent of wires was in direct charge of the transmission and distribution system of the company. He was born in Walpole, Mass., 61 years ago. He was educated in the public schools there and at the local high school.

Henry M. Lane

Henry Marcus Lane, at one time head of the Lane & Bodley Company, Cincinnati, lost his life on May 15, in the Cleveland Clinic Hospital disaster. Among achievements for which Mr. Lane Among the was noted were the design and construction at Cincinnati, in 1885, of the Walnut Hills cable railroad, the first in Ohio, and the Vine Street cable railroad in that city in 1887. He also was noted as a designer of large Corliss engines, used in cable railway installations and in early electric generating stations. He also was consulting engineer for cable railroads in several other cities. Mr. Lane was 75 years old. He was graduated from the Massachusetts Institute of Technology in 1873.

John E. Eustis, a member of the Pub-Service Commission for the District of New York, from 1907 to 1914, died on June 22. At the close of the Civil War he resumed his education, being graduated from Wesleyan University in 1874 with the de-gree of Bachelor of Science. In 1877 he received his law degree from the Dwight Law School, entering the legal profession as a member of the firm of Olin, Rives & Montgomery.

Industry Market and Trade News

Three Properties Order Standardized Cars

Recognition of the efforts of the car builders to produce standardized units is indicated by orders recently placed by three representative companies with the Osgood-Bradley Car Company, Worcester, Mass., for a total of 27 cars. Five cars will be delivered in August to the Altoona & Logan Valley Electric Railway, Altoona, Pa., while the Scranton Railway, Scranton, Pa., has ordered ten cars, and the Union Street Railway, New Bedford, Mass., has ordered twelve. The new cars, all of which are practically identical in design, differing only in certain minor features of trim and decorative effect, are of a type developed by the car builder's engineers with the view to combining pleasing appearance, balanced proportions, and easy riding qualities with rugged construction, light weight and features that would make for low operating and maintenance costs. A car of this type, built as a sample and distinguished by its designers with the trade name of "electromobile," was shown at the Cleveland convention last year, and was described in detail in Electric Railway Journal, issue of June 23, 1928.

The cars are built for double-end oper-

ation but with controls arranged for one-man operation if so desired. In general appearance they follow conventional lines with straight sides, rounded ends, and lowarch roof, but with the motorman's window of the sloping, automotive type. Standard structural shapes have been used in the framing, and, while an effort has been made to keep the weight at a minimum consistent with adequate strength and ruggedness, together with a liberal margin for safety, no attempt has been made to achieve extreme light weight. It is estimated, kowever, that each car will not exceed 34,000 lb. in weight, completely equipped. Perhaps the most unusual departure from the conventional is the elimination of the customary foundation brake rigging and the use of automotive type of brake diaphragms at each wheel, an arrangement which is expected to produce better equalization, simplified brake rigging, and a reduction in weight. Otherwise the trucks, which are Osgood-Bradley type 45-46, present no unusual features.

All operating apparatus, including controller handle, brake valve handle, reset switch handle, sign box handle, windshield wiper and light switches are within easy reach of the seated operator. Equipment cabinets and switch and control devices are built into the vestibules and concealed, although readily accessible through doors and panels. An arrangement of signal lamps indicates to the operator whether doors are open or shut, and door control is interlocked with motor control, so that

adequate heating and ventilating devices. Sixteen reversible cross seats, eight on each side of the aisle, are of the full upholstered type of composition leather, with deep spring cushions and individual form-fitting backs. Stationary foot rests are provided and grab handles are built into the seat framing next to the aisles. A longitudinal seat is built into each corner, and the capacity can be further increased, so as to provide seats for a total of 54 passengers, by the use of folding seats for three passengers each, which are provided on each side of each vestibule.

Detail specifications of the five cars of this type supplied to the Altoona & Logan Valley Electric Railway are shown in the

accompanying table.

Name of RailwayAltoona & Logan Valley Electric Railway
Ranway
City and stateAltoona, Pa.
Number of units5
Type of unit One-man, motor, passenger, city,
double-end, double-truck
Number of seats
Builder of carbodyOsgood-Bradley Car Company
City and state,
Date of order
Date of delivery August, 1929
Weight34,000 lb.
Bolster centers
Length over all
Length over body posts
Truck wheelbase
Width over all
Height, rail to trolley base
Window post spacing
BodyAll steet
RoofArch
DoorsEnd
Air brakesWestinghouse Traction Brake Company
Armature bearings
AxlesHeat-treated
Car signal aystemFaraday
Compressors
ConduitMetal
ControlSafety Car Type K75
Destination signs
Door mechanism
DoorsFolding

FinishEnamel
Floor covering
Gears and pinions
Glass (non-shatterable)Front
Hand brakesPeacock ataffless
Hand straps Elcou railing
Heaters Consolidated Car Heating Company
Heaters Consondated Car neating Company
HeadlightsCrouse-Hinds, Golden Glow
Headlining
Interior trim Statuary fimsh
Journal bearings
Journal boxes
Lamp fixturesElectric Service Supply MotorsWestinghouse 510A, outside hung
Motors Westinghouse 510A, outside hung
Painting schemeOrange, Pratt & Lambert
Roof material
Safety car devices St. Louis Safety Devices
Sash fixturesO. M. Edwards Company
Seats
Seat spacing
Seating material"Cletan" leather
Slack adjustersOsgood-Bradley
StepsStationary
Step treads
Two lless and above
Trolley catchersEarl
Trolley baseOB, form 4
Trolley wheels Electric Materials Company
TrucksOsgood-Bradley 45-66
VentilatorsGarland C-1 Junior
Wheels, steel
Wheelguards or fenders
Special devices

the car cannot be started until all doors are closed.

Special attention is given in the new cars to passenger comfort. The floor in the car body is finished with a composition, aisle width is 22 in., and wide vision windows of plate glass are provided, as well as

Track Improvements in Progress

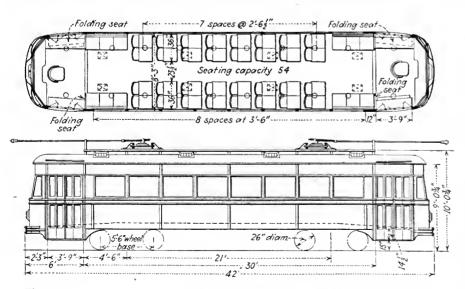
With the reconstruction of approximately 3,000 ft. of double track on Summer Ave. the Springfield Street Railway, Springfield, Mass., has just completed its biggest track job of the year. All-steel ties and 6 in. 100 lb. T-rail were used on this job, the total cost of which was about \$43,000.

To meet the demands of a \$500,000 road-way program now under way, the Memphis Street Railway, Memphis, Tenn., has purchased one differential motor car and trailer and one differential electric locomotive crane car. This equipment is to be manufactured by the Differential Steel Car Company.

More than 3,700 ft. of double track is being laid on Lincoln Way, Massillon, Ohio, by the Northern Ohio Power & Light Corporation. Specifications call for use of 100 lb. rail in concrete. The cost will exceed \$100,000.

The Scranton Railway Company, Scranton, Pa., will expend more than \$100,000 in a building and improvement program this year in the city and its suburbs. The work, which is mainly of a maintenance nature, calls for track and pavement reconstruction, new special work and the replacing of considerable 80 lb. rail with 100 lb. rail.

Illinois Terminal Railroad System will install some 20 miles of new 90 lb. rail at various points along its route.



Floor plan and elevation of new car for Altoona & Logan Valley Electric Railway

Canadian Railways Buying Many **New Cars**

RDERS for more than 260 new cars have recently been placed by electric railways in Canada, or are likely to be placed in the near future. One hundred and six street cars of the most modern type are being constructed by the Canadian Canad are being constructed by the Canadian Car & Foundry Company for the Montreal Tramways. The Toronto Transportation Commission has recommended to the board Commission has recommended to the board of control the purchase of 55 motor cars and 55 trailers. The Ottawa Car Manufacturing Company, Ltd., is building 21 cars for the Quebec Railway, Light & Power Company, seven for the Regina Municipal Railway, and five for the Saskatoon Municipal Railway, while the British Columbia Electric Railway of Vanish Columbia Electric Railway of Van-couver, B. C., has announced that fifteen cars will be purchased as soon as certain franchise difficulties are adjusted.

Deliveries under the Montreal order are already under way and it is expected that practically all of the cars will be completed by the end of July. A few of the cars under the contract will be the one-man type, in order to provide additional equipment for lines on which cars of this type are now authorized, but the greater part of the order will be of the two-man type such as are now used on the most heavily such as are now used on the most heavily traveled routes in that city. An unusual feature is the manner in which the new cars are to be heat insulated. Between roofs and ceilings and in wall panels hair felt is employed, while between the two wooden floors thick strips of cork are inserted. In addition to improving the heating facilities this will lessen vibration and ing facilities, this will lessen vibration and reduce noise. Thermostatic control of heating will be provided, to maintain an

even temperature and obviate the possibility of seats becoming overheated.

Details regarding the new Toronto cars are not available at this time as the order has not been placed, but it is estimated that the total cost, including motors, will be about \$1,750,000. Of the cars ordered by the Quebec Railway, Light & Power Company, six are of the interurban type of semi-steel construction, weighing complete about 85,000 lb., and fifteen are for city service, being of the single-end, two-man type, seating 35 passengers. The Regina and Saskatoon cars are also for city service, the former being of the one-man, singleend type, while the latter are of the oneman, double-end type. Like the Montreal cars they are to be heat insulated, with construction throughout incorporating many of the latest features making for passenger comfort and easy riding qualities. Details regarding the Regina, Quebec and Saskatoon cars, all of which are being built by the Ottawa Car Manufacturing Company, of Ottawa, Ont., are set forth in the accompanying tables.

	SPECIFICATIONS FOR C.	ARS RECENTLY ORDERED BY	CANADIAN PROPERTIES	
Name of Railway City and state	Regina Municipal Railway	Saskatoon Municipal Railway	Quebec Ry., Lt. & Power Co Quebec, Que	Quebec Ry., Lt. & Power Co. Quebec, Que.
Number of units	7	5	15	6
Type of unit	One-man	One-man	Two-man	Two-man Motor
	Passenger	Passenger	Passenger	Passenger
	City	City	City	Interurban
·	Single-end.	Double-end.	Single-end.	Single-end
	City Single-end Double-truck	City. Double-end. Double-truck	City Single-end Double-truck	Double-truck
Number of seats	40	Ottawa Car Manufacturing Co	Ottawa Car Mfg. Co.	37
Builder of car body	Ottawa Car Manufacturing Co	June, 1929	Uttawa Car Mfg. Co	Ottawa Car Mfg. Co. May, 1929
Date of order	Feb. 1929	Nov 1929	Feb. 1929	Jan., 1930
Weight, car body	17,400	Nov., 1929 14,365	Aug., 1929 19,050	45,000
Trucks	10,000	9.895	10,440	18,000
Equipment	6,600	6,240	9,220	22,000
Total	34,000	30,500	38,710. 17 ft. 7 in	85,000
Bolster centers Length over all	17 ft. 7 in	18 It	41 ft 2 in	40 ft. 65 ft.
Length over body posts	26 ft. 41 in	39 ft. 3 in. 25 ft. 8 in.	41 ft. 2 in. 26 ft. 4½ in.	53 ft. 1 in.
Truck wheelbase	5 ft. 4 in	4 ft. 10 in	5 ft. 4 in	7 ft.
Width over all	8 ft. 3 in	7 ft. 9} in	7 ft. 11} in	10 ft.
Height, rail to trolley base	10 ft. 10} in	101t, 11 in	H ft	12 ft. 8 in.
Window poet spacing	30 in	30 in	30 in	32 in.
Body	Arch	Semi-steel	Semi-steel	Semi-steel Arch
Roof. Doors.	End. folding	End. folding	End. folding	End
Air brakes	End, folding. General Electric Co	End, folding	End, folding. Westghse 10x12 in, types "S"	Westinghouse
Armature bearings	Plaio	Plain	Plain A.E.R.E.A standard	Plain
Axles	Forged steel, 4 in. diameter	A.E.R.E.A standard Consolidated Type 233-Y	A.E.R.E.A standard	Forged steel, 61 in. dia.
Car signal system	Consolidated	General Electric CP-27-B	Westinghouse Type 233-D	Consolidated
Conduit	General Electric CP-27-B. Metal K-35 IIH with LB-2 handle	Galvanized steel	Consolidated Type 233-D Westinghouse Type DH-16 Galvanized steel Westinghouse K-35-HHI	Westinghouse Metal
Control	K-35 llH with LB-2 handle	K-35	Westinghouse K-35-IIII	Westg, 15-B-2 master control
Couplers				i Van Dorn No. 2374 M.C.R
Curtain fixtures	National Lock Washer	National Lock Washer Co		National Lock Washer Co.
Curtain material Destination signs	Pantasote No. 86-K2	Pantasote. Ottawa Car Mfg. Co.	Keystone	Pantasote No. 2577 Keystone
Door mechanism	Ottawa Car Mfg. Co	National Pneumatic Co	National Pneumatic Co	Keystone
Doors	Transfer a ficalitatic Co			
Energy saving device	Economy Electric Devices Co	National Pneumatic Co	National Pneumatic Co	
Fare boxes	Cleveland No. 5	Cleveland No. 5	Cleveland No. 5	
Finish	Duco	Duco	Duco	Duco
Floor covering	Wood slats, Kass treads Steel 74:13	Wood treads	Wood slats, Kass safety treads	Nuttall
Glass	D.S.S. and Protex.	Tool steel	Tool steel D.S.A.A. and Protex	D.S.S. and Protex
Hand brakes	Peacock	Peacock staffless	Peacock stafflessO.C.M. Co's stand, grabrails	Peacock
Hand straps Heat insulating material			O.C.M. Co's stand, grabrails	None
Heat insulating material	Plastic cork. General Electric Co	in. cork.	Cork insulation, 1-in	Plastic cork
Headlights	Golden Glow R. M96	Consolidated and Peter Smith	G. E. Calrod, 400 w., 500 v	General Electric Company Golden Glow
Headlining	Haskelite	Golden Glow Type R. M. L96 Haskelite, 3/16 in	Keystone Type DG Haskelite, 3/16 in	Agasote
Interior trim	Aluminum	3/16 in. Haskelite and birch	Birch	Bronze
Journal bearings	cars plain, 2 cars roller, S.K.F	S.K.F. roller	A.R.A. standard	Plain
Journal boxes	Cast iron	Floatric Cornics Cumple Co	3½x7-in	Malleable
Lamp fixtures	Electric Service Supply Co., Dome Four G.E. 264A, inside hung	Electric Service Supply Co Four G.E. 264, inside hung	Electric Service Supply Co Four Westghse. 40 hp. in, hg.	Elec. Service Sup. Co., Dome Westghse 125 hp., ins'd hung
Motors Painting scheme	Red and cream	Olive green and cream	Red and cream	Maroon
Registers				None
Roof material	Basswood, canvas covered	Haskelite covered with duck	7/16-in. hasswood covered with No. 10 duck	Basswood and canvas
Safety car devices	National Pneumatic Co Robert Mitchell Co., Ltd	National Pneumatic Co Robert Mitchell Co., Ltd	National Pneumatic Co Robert Mitchell Co., Ltd.,	
9			brass sash	Brass
Seats	Ottawa Car Míg. Co	Hale & Kilburn No. 300	O.C.M. Co. standard	O.C.M. Co. 32 in.
Seat spacing	30 in	30 in	Spanish leather	Pantasote No. 707
Slack adjusters	General Electric E-1	American Automatic, Form E-1	American Auto., Form E-1	Westinghouse
Steps	Folding	Folding	Folding Kerlow "Honeycomb"	Stationary
Step treads	Honey-comb anti-slip	Folding Kerlow "Honeycomb" Obio Brass Co. No. 13141	Kerlow "Honeycomb"	Kass
Trolley base	Ohio Brass Co. No. 8112-1 Ohio Brass Co. No. 4	Unio Brass Co. No. 13141	Ohio Brass Co. No. 13119	Ohio Brass Co. U. S. 20-A
Trolley wheels	Kalamazoo 41 in	U. S. 20-A. Ohio Brass Co.	Ohio Brass Co. No. 15238-	Ohio Brass Co.
			15239	
Trucks	Canadian Car & Foundry Co	National Steel Car Corp	Canadian Car & Fdry. Co	Baldwin Locomotive Works
Ventilators	Nichols-Lintern	Nichols-Lintern 6x8-in Rolled steel, 26-in. diameter	Nichols-Lintern 6x8-in Rolled steel, 27-in, diameter	Nichols-Lintern U. S. Steel r'ld steel, 33-in. dia
Wheelguards or fenders	Ottawa Car Mfg. Co	Ottawa Car Mfg. Co. life guard	Ottawa Car Míg. Co. life g'rd	o. b. blueir id steet, 53-in. dia
	3 Oat 5.0-B. O-111111111111	Commission of the guardine	Car saig. Co. mog ra	

Electric Railways Add to **Bus Fleets**

Electric railway properties in various sections of the country continued to add to their bus fleets during the month, the majority of buses purchased being of the large capacity type and for city service. The Boston Elevated Railway has ordered nine 40-passenger buses from the Twin Coach Corporation, of which several have been delivered within the past week. When deliveries are completed the company will have 35 Twin Coaches in service, in addition to a number of other large capacity buses of the Versare and ACF types. All of the recent order are of the straight

mechanical type.

Twenty-nine buses each with a seating capacity of 40 passengers have been pur-chased within the last thirty days by the Northern Ohio Power & Light Company, Akron, Ohio, from the Twin Coach Corporation. Twenty-five of the new buses, including six of the express type, will go into service on the Akron city lines, two express type buses will be placed in service between Dover and New Philadelphia to take the place of the local car service formerly operated between these cities, but which was recently discontinued, and two express buses will be kept in reserve. The express buses will be kept in reserve. cost of the new coaches exceeds \$300,000, and when the order is completed the company will have 82 of these 40-passenger buses in operation, in addition to over 200 buses of other types and lesser capacity.

Twin Coach Corporation has delivered three buses of the parlor car type to the Southern Pacific Motor Transport Company for service out of Portland, Ore., four urban type buses to the Los Angeles Motor Coach Company, two urban type buses to the Tennessee Electric Power buses to the Tennessee Electric Power Company, at Chattanooga, and four of the urban type to the Detroit Motor Bus Com-pany. The Detroit Company now has 24

buses of this type in its fleet.

The Wisconsin Power & Light Company, Janesville, Wis., has purchased seven 23-passenger Yellow Coaches for service on the Janesville city lines. The buses cost about \$6,000 apiece.

The Pacific Northwest Traction Company, Seattle, Wash., has purchased two White buses of the 30-passenger type and four ACF buses of slightly larger capacity, all for intercity service. The body design of the new buses incorporates the raised observation compartment in an improved form, a feature originated on this property.

During the later part of May the first burning the later part of May the first of the new super-service buses being built by the Public Service Co-ordinated Transport was turned out of the Newark shops. The new type of bus accommodates 32 passengers in seats of green leather with arm rests and extra high backs and head-rest. Other equipment includes halloon rest. Other equipment includes balloon tires, specially designed springs with an extra long wheelbase, and a heating and ventilating system of the blower type controlled from the instrument panel. Ninetytrolled from the instrument panel. Ninety-four bodies of this type will be constructed in the Newark shops for mounting on chassis supplied by the General Motors Truck Corporation. The buses will be used for long hauls in interstate and suburban service.

Citizens Transit Company, a subsidiary of Citizens' Traction Company, Oil City, Pa., has taken delivery of one ACF urban

type coach.

The Southern Michigan Transportation Company, controlled by the Michigan Electrie Railway, Jackson, Mich., has pur-chased five metropolitan type coaches and three parlor coaches from the ACF Motors

Logan Valley Bus Company, subsidiary of the Altoona & Logan Valley Electric Railway, has received one ACF 23-passenger urban coach.

senger urban coach.

The Fonda, Johnstown and Gloversville Railroad, of Gloversville, N. Y., has accepted delivery of four Mack model AB four cylinder 25-passenger city type buses.

The Connecticut Company, New Haven, Conn., has accepted delivery of two Mack

model AB 29-passenger city type buses.

The Denver Tramway Company, Den-

ver, Col., has received two White model 54 six cylinder buses and one model 53 bus. The Alabama Power Company has pur-

chased a White Model 50B bus for serv-

ice in Birmingham, Ala. Eight 21-passenger Fitzjohn pay-enter grand coach bodies mounted on Reo GB 179 in. wheelbase chassis have been delivered to the Montreal Tramways, Montreal. Can.

Wheelguards to Replace Fenders on Seattle Cars

George B. Avery, superintendent of public utilities, Seattle, Wash., has obtained approval of the Board of Public Works for a plan to replace the present street car fenders with wheelguards. Six feet of space will be saved on every two cars in the crowded downtown business district at the peak of the day's rush hour, according to Mr. Avery.

Laconia Car Company, Laconia, N. H., through its directors, has decided to close the company's car building department and liquidate the assets incident to that part of its business. closing of this department brings to an end a New England industry that has been in business for nearly 100 years.

American-LaFrance & Foamite Corporation, Utica, N. Y., has installed the fire fighting apparatus in the new municipal auditorium at Atlantic City.

Peter Smith Heater & Manufacturing Company, Detroit, Mich., has changed its name to Peter Smith Stamping Company, with the heating branch of the business operated under the name of Peter Smith Heater Company, a separate corporation.

General Electric Company, Scheneetady, N. Y., has published bulletin GEA-991 descriptive of insulating material for railway and industrial-haulage appara-

Wagner Electric Corporation, St. Louis, Mo., has issued bulletin No. 162 on Wagner transformer oil, containing complete specifications as prepared for their own organization, but recently released for transformer buyers and users. The bulletin discusses the purposes of transformer oil, its properties, methods of testing, and precautions to take when handling and storing.

Perey Manufacturing Company, Inc., 101 Park Avenue, New York, has issued a folder describing the value of Perey turnstiles in preventing pilfering and "gate crashing" and in toning up the morale of an operating organization through removing the temptation to defraud.

International Steel Tie Company, Cleveland, Ohio, has published in pamphlet form the results of the recent Nielsen survey covering the use of steel twin ties on the property of the Kansas City Public Service Company.

Westinghouse Electric & Manufacturwestinghouse Electric & Mahufacturing Company has released circular No. 1834 entitled "Synchronous Visual Supervisory Control," describing the present types of Westinghouse supervisory control units, giving their application, advantages, and system of operation. The circular is illustrated with typical control equipment control equipment.

ELECTRIC RAILWAY MATERIAL PRICES—JUNE 29, 1929

Metals—New York		Paints, Putty and Glass-New Y	ork
Copper, electrolytic, delivered, cents per lb. Lead, cents per lb. Lickel, cents per lb., ingot. Linc, cents per lb. Linc, cents per lb. Lluminum, 98 to 99 per cent, cents per lb. Sabbit metal, warehouse, cents per lb.: Commercial grade. General service.	18. 7.00 35. 6.725 44.583 24.30 45.00 31.50	Linseed oil (5 bbl. lots), cents per lb	11.1 13.2 \$0.56 5.725
Bituminous Coal		Weatherproof wire base, cents per lb	20.875
Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons Omerset mine run, f.o.b. mines, net tons Pittsburgh mine run, Pittsburgh, net tons ranklin, Ill., screenings, Chicago Central, Ill., screenings, Chicago Sansas crushed mine run, Kansas City Track Materials—Pirtsburgh	\$4.10 1.80 1.70 1.70 1.35 2.25	Paving Materials Paving stane, granite, 5 in., f.o.b. New York—Grade 1, per thousand Wood block paving 31, 16 lb. treatment, N. Y., per sq.yd., f.o.b. Paving brick 31,81,4, N. Y., per 1,000 in carload lats, f.o.b.	\$150 \$2.78 51.00
tandard steel rails, gross ton tailroad spikes, drive, r_t in. and larger, cents per lb ie plates (flat type), cents per lb ingle bars, cents per lb tail bolts and nuts, cents per lb teel bars, centa per lb leel bars, centa per lb les, white oak, Cbicago, 6 in.x8 in.x8 it	\$43.00 2.80 2.15 2.75 3.90 1.95 \$1.40	Paving brick 3x84x4, N. Y., per 1,000 in carload lots, f.o.b	45.00 3.25 2.05 3.25 2.00
Hardware—Pittsburgh		Old Metals-New York and Chic	ago
Vire nails, base per keg	\$2.70 2.90 3.65 3.35 3.15	Heavy copper, cents per lb. Light copper, cents per lb. Heavy yellow brass, cents per lb. Zinc, old scrap, cents per lb. Lead, cents per lb. (heavy). Steel car axles, Chicago, net ton.	13.75 12.00 8.25 3.25 5.00 \$16.75
Vaste, wool, cents per lb Vaste, cotton (100 lb. bale), cents per lb.: White Colored	13. 12.5 9.5	Cast iron car wheels, Chicago, gross ton Rails (abort), Chicago, gross ton Rails (relaying), Chicago, gross ton (65 lb. and beavier) Machine turnings, Chicago, gross ton	14.75 18.75 28.50 7.75

Ti



SAFETY

Can Be Bought

PEACOCK

STAFFLESS BRAKES

Because Peacock Staffless Brakes arrest the momentum of the car instantaneously—with a braking force on the wheel of 3000 lbs.

There is no chance of the chain binding or clogging—no limit of safety is countenanced, for Peacock Brakes can wind up 12 feet of chain.

And, too, worn brake shoes do not deter positive braking.

NATIONAL BRAKE COMPANY, Inc.

890 Ellicott Square, Buffalo, N. Y.

General Sales Office: 50 Church St., New York

Canadian Representative: Lyman Tube & Supply Co., Ltd., Montreal, Can.



Special Track Layouts

Bethlehem Track Specialties

Special Trackwork
Tie and Girder Rails
Special Splice Bars
for Welding

Abbot and Center Rib Base Plates

Tie Rods and Tie Plates
Hard Center Frogs and Mates
Rolled Alloy Steel Crossings
Silico-Manganese
Special Trackwork

Before shipment every Bethlehem Special Track Layout is completely assembled—not in the open but under cover, in spacious, well-lighted shops where conditions favor accurate, painstaking workmanship.

Both by facilities and experience Bethlehem is thoroughly equipped to produce special trackwork for all requirements.

BETHLEHEM STEEL COMPANY

General Offices: BETHLEHEM, PA.

DISTRICT OFFICES: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffala, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, 25 Broadway, New York City.
Sole Exporter of our Commercial Products.

BETHLEHEM





Modern Seat in Every Way!

In every possible way this de luxe seat fulfills the requirements of modern bus travel. The 90 P is a smart looking, luxurious style that offers real comfort and relaxation on the long haul. Among its unusual features are the broad roll headrests; the deep, removable comfy spring cushions; and shaped, comfy spring back pads. This style is made with only one armrest to increase comfort and conserve space. This chair may be secured with fibre sides in any desired color. Write to the nearest Heywood-Wakefield sales office for complete details on the 90 P and other popular bus seats in our line.

HEYWOOD - WAKEFIELD . COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City J. R. Hayward, Liberty Trust Bldg., Roanoke, Va. H. G. Cook, Hobart Bldg., San Francisco, Calif. 439 Railway Exchange Bldg., Chicago, Ill. A. W. Arlin, Delta Bldg., Los Angeles, Calif. The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation
133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada



If you have not received a copy of our new Bus Seat Catalogue, write for it.

100

THOMAS-BUILT CARS now on the Streets of Detroit

A LL produced on a single order, delivered at the rate of 8 cars a week. Everyone complete to the smallest detail, ready for immediate service.

It is not often that a builder of street cars is given such an opportunity to demonstrate so conclusively the qualities of his organization.

And to those responsible for awarding the Detroit contract, we owe a lasting debt of gratitude for their close study of our past record, our facilities and our personnel, to the upbuilding of which we have devoted every effort for the entire period of our existence.

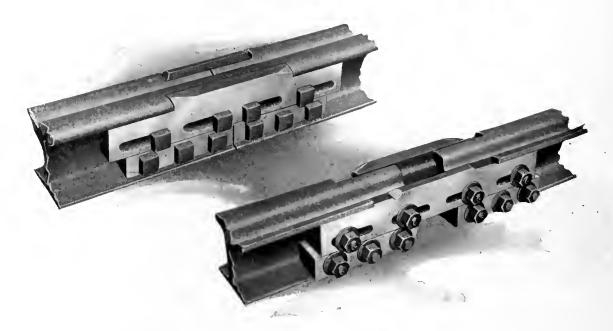
Street railway operators who contemplate adding to their rolling stock are invited to communicate with this youthful company which eagerly awaits the occasion to prove itself worthy of your confidence.

PERLEY A. THOMAS CAR WORKS High Point, N. C.

THOMAS



LORAIN



Expansion Joint

Pittsburgh Railways Company's Standard

THIS type of joint is extensively used, particularly on bridges, and consists of an outside or head bar, which is made of manganese or other alloy steel, a tram side bar, which is cast steel, four steel flange blocks, two rails and necessary bolts.

This illustration shows short pieces of rail, but these rails are furnished in lengths as desired, usually 8 feet each. The extreme ends of the rails are drilled for standard joints and the expansion ends are specially machined, to accommodate the expansion bars and provided with round holes for the through bolts.

The four flange blocks are bolted permanently to the rail ends, and the head and tram bars are provided with slotted holes to take care of the expansion.

The upper illustration shows the joint practically closed while the lower shows it partly open. This joint takes care of expansion up to 3½ inches.

Girder Rails

Girder Guard Rails

Plain Girder Rails

Rail Joints and Track Accessories

Expansion Joints for Electrically Welded Track

Special Trackwork

Switches, Frogs and Crossings

Solid Manganese Steel, Manganese Insert Construction, Chrome Nickel Steel Insert Construction and Built-up Construction of all heights and weights of rail

The Lorain Steel Company General Offices: 545 Central Avenue, Johnstown, Pa.

UNITED STATES STEEL CORPORATION

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

AMERICAN BRIDGE COMPANY CARNEGIE STEEL COMPANY AMERICAN SHEET AND TIN PLATE COMPANY AMERICAN STERL AND WIRE COMPANY CYCLONE FENCE COMPANY FRDERAL SHIPBUILDING AND DRY DOCK COMPANY Pacific Coast Distributors—United States Steel Products Company, San Francisco. Los Angeles, Portland, Seattle, Honolulu.

ILLINOIS STEPL COMPANY MINNESOTA STEEL COMPANY NATIONAL TUBE COMPANY

THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R. R. COMPANY UNIVERSAL PORTLAND CEMI Export Distributors-United States Steel P

Sales Offices:

ATLANTA

CHICAGO

CLEVELAND

DALLAS

NEW YORK

PHILADELPHIA

PITTSBURGH:

Urban coach transportation — years ahead of its time!

THE Q, C, f, METROPOLITAN 40 PASSENGER COACH







SAFE, COMFORTABLE, PROFITABLE URBAN COACH TRANSPORTATION

Especially designed for eongested city traffic, the new Q, C, f. Metropolitan is the highest development of mechanical and economic efficiency yet attained in this type of bus transportation.

The Q.C.C Metropolitan is an achievement that only the vast resources of Q.C.C and its years of experience in the production of mass-transportation units could make possible.

PERFECT WEIGHT DISTRIBUTION

There is no overhang beyond the front axle. The front end cannot strike the road . . . And there is perfect control at all speeds. The driver can gauge his clearances within a fraction of an inch. Front tire failure or bad road conditions cannot affect safe steering control.

Normal tire sizes are used both front and rear. And because of their location the front tires *cannot* become overloaded.

SAFETY AND LONG LIFE

The body of the Q.C.f. Metropolitan is all steel. Steel frame... steel pillars... steel panels... all riveted together... steel to steel. Even the panels are 16 gauge steel; for the panels, too, bear part of the load. Steel, properly painted does not deteriorate, and when that steel is riveted wear cannot begin because no movement occurs.

Because of this construction the Q.C.f. Metropolitan will give more years of continuous, operating, revenue-producing life than any other urban coach.

CAPACITY

Although the Q.C. C. Metropolitan uses a normal wheelbase of 230 inches and a normal width, it seats—comfortably—40 passengers, with an overload standee capacity of 100% to 150%.



DRIVER POSITION

The driver has perfect vision on three sides; and he has to turn slightly to give attention to incoming and outgoing passengers. This is a strong safety asset. Because he is compelled to come to a full stop before taking on or letting off passengers, careless accidents are almost impossible.

PERFORMANCE

The Q.C.C. Metropolitan will accelerate taster than any other 40-passenger unit. It will turn in smaller space and around tharper corners than any other 40-passenger unit, and many 29-passenger units.

Definite records indicate a brake lining life of between 30,000 and 40.000 miles. The drum wear at 50,000 miles is imperceptible, assuring brake drum life of 50,000 to 300,000 miles. Original tires till in service after 40,000 miles look good for at least 15,000 more.

MAINTENANCE

All steel construction practically eliminates body maintenance. The Hall-Scott engine has long since proved its merits in heavy duty transportation. The short drive shaft (only 26ⁿ) reduces the heavy maintenance expense and loss of power of the usual long drive line.

And there is only one engine, one clutch, one transmission, one drive line, and one set of engine accessories to care for.

APPEARANCE

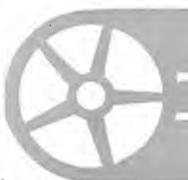
The Q.C.f. Metropolitan is modern and unusual, but not radical. Its distinctive design, startling beauty and luxurious comfort are the result of the application of correct engineering principles rather than artificial distortions . . . Beauty to attract capacity loads . . . comfort, luxury and fine performance to hold them.



THE METROPOLITAN IS READY NOW FOR LARGE SCALE PRODUCTION

With the Metropolitan, the vision of Q,C,C engineers, and the vast Q,C,C resources and experience behind them, have produced a mass transportation unit that in the ordinary course of events, might not have been developed for another decade::: Write for full details and specifications.

AMERICAN CAR AND FOUNDRY MOTORS COMPANY
30 CHURCH STREET · NEW YORK CITY





On the one hand—gruelling, grinding gaff . . . on the other—shock-proof, thrust-proof, torque-proof, speed-proof Timken Bearings.

At every vital point they stand their ground against depreciation and wear.

Youth abides in Timken-equipped buses... and profits accrue as a direct result. As time goes on and miles go by Timken-equipped buses go on running and earning.

Timken-equipped buses stay young because of these exclusive guardians of machine life—Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken-made steel.

Specify "Timken Bearing Equipped" and you get the bearingprotection which is universal in use and choice—wherever wheels and shafts turn.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN Tapered BEARINGS



There are no "selling points" to a Stradivarius

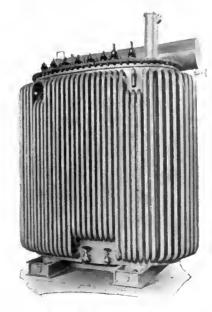
It is simply the world's finest violin because Stradivarius knew his business better than anyone before or since. He built a better violin because he took more pains with little things other violin makers considered unimportant.

ABB transformers are the result of similar recognition of the supreme importance of little things. Packard transformers have been built in the United States for

39 years. Brown Boveri transformers have been built in Europe and used all over the world for 38 years. For the most part, the experience of these two companies was not co-extensive. A Packard-ABB transformer that is built today represents the total experience of Packard and the total experience of Brown Boveri and incorporates every important little thing discovered in 77 years of striving to build perfection.

One of the important little things

The oil used in ABB transformers is the result of the combined experience and development of oil refiners and scientists of two continents. It was developed primarily to meet service conditions in Europe with transformers operated on a 70° C. rise basis. It is the Only oil manufactured in the United States which meets ABB specifications.





AMERICAN BROWN BOVERI CO., INC.

AMERICAN BROWN BOYERI

Cutting the Cost of Trolley Pole Service!

THE actual cost of trolley pole service is not confined to the purchase price of the pole itself. What the pole can do from day to day to keep down delays, avoid traffic tie-ups and eliminate frequent repairs or replacement of poles—are factors that determine the ultimate cost of trolley pole service.

NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight. A special form of reinforcement at the proper place gives the pole great strength while the grade of steel used and a special heat treatment after drawing gives a high elastic limit and assures long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.

NATIONAL TUBE COMPANY • Pittsburgh, Pa.
Subsidiary of United States Steel Corporation





Which proves that it BRMIT

1909



Condition of joint 5 years after new rails were laid

It took only five years to produce the result shown above. And that was on brand new rails. The company could easily have patched this joint and smoothed it off. Then it would have been as good as new-for another brief period. But the "easiest way out" is not the cheapest in the

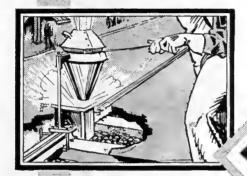
Rather than patch this joint, the company wisely decided to Thermit Weld. That was fifteen years ago. Now observe the picture and story of the same joint on the opposite page.

1914

METAL & THERMIT
PITTSBURGH CHICAGO BOSTON 120 BROADWAY

pays to WELD

1914



Condition
of that same
rail joint
15 years after
Thermit Welding.

Today the joint is smooth as when the tracks were laid twenty years ago. To be sure, the rails are worn, after so many years of heavy traffic, but for 15 years the pavement had been undisturbed,—the slight extra cost of Thermit Welding has been absorbed,—and what is more, the life of the rails has been extended many years to come.

Consider these facts when you are laying new rails or repairing worn joints. In either case, you'll find it pays to Thermit Weld.

1929

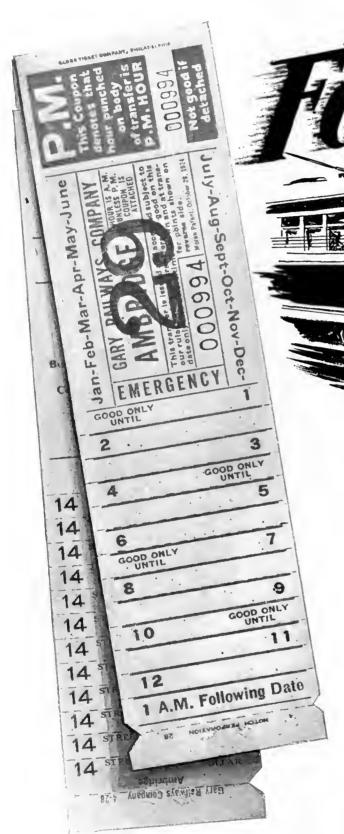


CORPORATION

NEW YORK, N.Y.

SOUTH SAN FRANCISCO

TORONTO



Showing both sides of the Moran Patent Transfer. The perforations at each indicated hour make its issuance fast and easy.

and safer

This Moran Patent Transfer has three very decided advantages in transferring crowds of passengers at all hours.

First—The P.M. Coupon, if left intact, indicates that the time shown is between noon and midnight. When the conductor tears it off, it automatically indicates morning time.

Second—The transfer, when issued, is torn off at the proper time limit. This shortens the transfer by an amount determined by the time. Any attempt to use the transfer after the limit is instantly noticed, due to the difference in length.

Third—The transfer is perforated at each hour. This means that the conductor requires no tear off instrument.

Many prominent operators use this transfer to great advantage. It eliminates fraud to a great extent. It is faster and easier to handle. Write us for samples.

Globe TICKET COMPANY

112 North Twelfth Street PHILADELPHIA

Factories
PHILADELPHIA NEW YORK BOSTON LOS ANGELES JACKSONVILLE, FLA.
Sales Offices
BALTIMORE CINCINNATI CLEVELAND PITTSBURGH SYRACUSE, N. Y.



Gas-Electric Cars Need This High Braking Power

REQUENT STOPS are a feature of Gas-Electric car service. This calls for braking power as well as starting power.

You depend on Gas-Electric equipment to improve schedules—give them the means for doing so by applying Simplex Multiple Unit Clasp Brakes.

With two brake shoes per wheel instead of one, the Clasp Brake produces the maximum retarding effect, with minimum wear and tear on truck and journal parts. It also relieves the thrust on the motor bearing that otherwise occurs in one-sided braking.

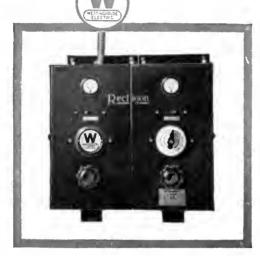
The Simplex Multiple Unit Clasp Brake affords smoother braking with less heating of brake shoes and reduces the number of "slid flat" wheels. It is an essential part of Gas-Electric railway equipment.



AMERICAN STEEL FOUNDRIES NEW YORK CHICAGO ST.LOUIS



Low first cost . . . low upkeep cost low attendance cost



Rectigons are made in two sizes, 15 and 30 battery capacity, at \$75 net and \$135 net, respectively.

each battery



charged with this

rectigon



and

this bulb



gives

you..a lower

charging cost

The secret of battery charging economy lies in these three factors that the Rectigon gives you. You find them in no other type of charging equipment.

One man can install the Reetigon in less than an hour. No unlooked for maintenance expense can increase your costs. No drop in efficiency can menace the savings the Rectigon assures. You can look forward to years of service with only inexpensive bulb renewals to be made at long intervals.

The Rectigon needs no specialized knowledge to keep it operating and no attendant is required to watch the batteries on charge. Use it for night charging and get new efficiency from twenty-four hour service.

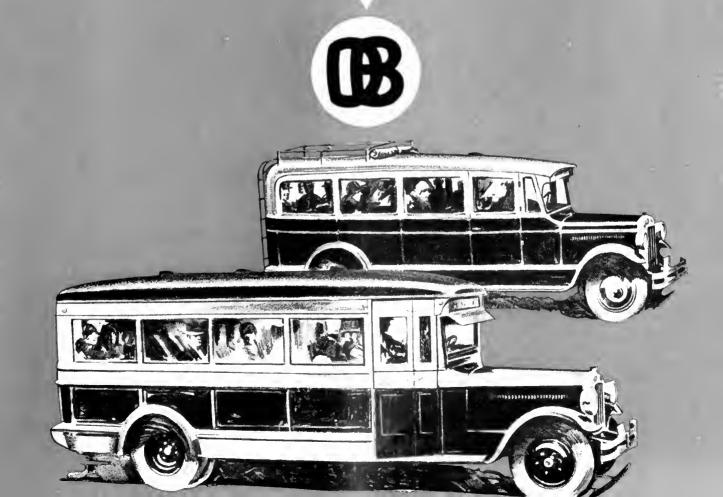
The booklet, "More Power to the Battery," tells how the Rectigon keeps down battery charging costs. Write for a copy.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
Merchandising Department East Pittsburgh, Pa.

Westinghouse

Use only genuine Westinghouse Bulbs for replacements

FOR PEAKS AND OFF-PEAKS
FREQUENCY OF SERVICE
LOW OPERATING COST
LOW INITIAL COST
SAFE INVESTMENT
RIDER APPEAL
REVENUE
VALUE







CHRYSLER MOTORS PRODUCT

SOLD AND SERVICED BY

on every count Dodge Motor Coaches

These modern coaches have everything that you need to insure low cost, patronagebuilding service and investment safety

Seek the reasons for the constantly increasing preference being given Dodge Brothers Motor Coaches and basic facts stand forth.... This year and for years they have worked dependably under various traffic requirements—have attracted the patronage of millions of riders—and have shown high earning ability on the record sheets of their owners.

Medium in size and attractively priced, these fast, powerful, economical coaches may be operated more frequently....they earn consistently during both peak and off-peak periods.

Their appearance attracts riders. Their comfortable seats, 6-cylinder smoothness and quiet, hydraulic 4-wheel brake safety, 3-stage progressive rear springs for riding ease, and quality design in every detail please riders and win their continued patronage.

With coaches such as these, safety of investment is assured. Returns are certain. You play safe on every count.

BROTHERS COACHES

DODGE BROTHERS DEALERS EVERYWHERE



For riders with that "in-between" preference-

Already large, and ever growing, is that class of riders who want that service which is "in-between" the street cars and high-priced transportation.

Dodge Brothers 16-passenger Parlor Coaches meet this demand. They are fast, powerful, safe, quiet and comfortable. Their fine appearance attracts patronage. Their sturdy, simple construction keeps operating costs exceptionally low. Their fitness has been proved in large cities and small the country over.

See your local Dodge Brothers dealer or write direct to Dodge Brothers Corporation, Detroit.

DODGE BROTHERS MOTOR COACHES

SOLD BY DODGE BROTHERS DEALERS EVERYWHERE

IT'S THE NON-STOP MILEAGE WEY'S



THAT MAKES THE BIG HIT

General Builds a Special Tire For Every Kind of Service

The most complete line on the market

General's leadership in supplying the big share of the truck and bus market is the result of its complete and specialized commercial line—each tire designed and built expressly for the work it must do.

Years of study in seeking out and solving the toughest problems in tire operating costs lie back of each General pneumatic or cushion. There is a General for *your* job—engineered to give you big, uninterrupted, economical mileage.

The General Tire dealer has all the information gained by General's engineering service at his finger tips. He knows the right tire for your equipment—it will pay you to see him. The General Tire and Rubber Company, Akron, Ohio.

The Complete General Commercial Line Includes:

Dual-Grip Truck Cord; Truck and Bus Balloon; the "Jumbo" Ford and Chevrolet line; Heavy Express Special; One-Ton Express Special; Regular Cushion; Demountable Cushion; Heavy Duty Non-Skid Cushion; high speed and regular; Extra Heavy Non-Skid Cushion; Air Center Cushion, non-skid and rib tread; High Smooth Cushion.



GENERAL TI



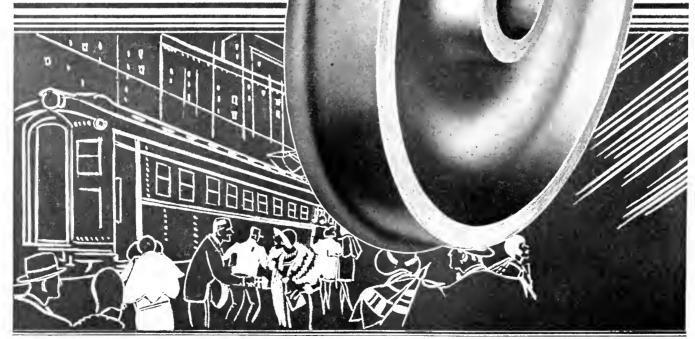
The



Into them have been built all the safety, all the dependability, all the trouble-free mileage that long steel-making knowledge and extensive wheel-making experience can provide.... Our wheel engineers are always glad to co-operate with your engineers in the solution of your wheel problems.

Illinois Steel Company

Subsidiary of United States Steel Corporation General Offices: 200 South La Salle Street, Chirago



ALL THAT GOOD WHEELS SHOULD BE

Italy Repeats

with

830 Sets of "Tool Steel" Gears

Then With

1200 More Sets of "Tool Steel" Gears

Last year the City of Milan, Italy, began to revamp their electric railway system. After exhaustive tests of both American and European gears they placed an order for 830 sets of Tool Steel "Quiet" Gears.

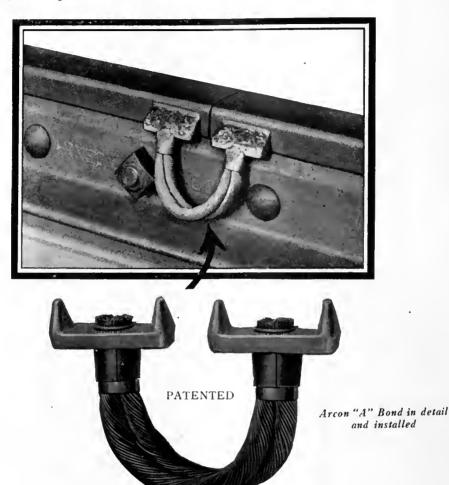
Recently we received a cable order for 1200 additional sets to complete the job.

Proof positive of the superiority of "Tool Steel" Quiet Gears.

The Tool Steel Gear and Pinion Company Cincinnati, Ohio



American Steel & Wire Company ARCON RAIL BONDS



NEW principle of design is embodied in Arcon Rail Bonds. This is the open terminal.

The open terminal has many distinct advantages. All terminals provide for easy arc manipulation. The end of the copper conductor is approximately one-eighth of an inch from the rail, and located in an open space which insures perfect welding of the copper wires. The sloping surface of the terminal after welding is a novel and important feature in arcweld bonds.

Be convinced by a practical demonstration which we will gladly give you at your convenience.

Prices and literature mailed upon request.

AMERICAN STEEL & WIRE COMPANY

NEW YORK NEW YORK 30 Church St. BOSTON Statler Bldg. PITTSBURGH Frick Bldg. PHILADELPHIA Widener Bldg. ATLANTA 101 Marletta St. WORCESTER 94 Grove St.

Do You Know

... that spray painting methods with proper facilities will cut your painting cost on street cars and motor buses 50%? Do you know that the number of reserve street cars or buses may be reduced through a reduction in the "Out of Service" time required for refinishing? Do you know that if spray painting methods were employed 75% of the floor space in your present paint shop could be utilized for other purposes? Do you know that spray painting gives you a finer finish with much longer

life? Do you know that Railroads, Street Railways and Motor Bus operating companies are rapidly adopting this modern method of refinishing? ¶ Mahon engineers are prepared to show you definite figures from actual operation. This staff of highly specialized Spray Booth experts will cooperate with you in working out a Spray Booth installation best suited to your particular requirements. Consultation with these specialists will not place you under obligation. Write today.

THE R.C.MAHON COMPANY DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial

Drying Ovens and Blow Pipe Systems

MAHON

SPRAY BOOTHS & EXHAUST STACKS



1 Accelerated Transportation must be made SAFE

For the sake of their patrons . . and their profits . . . modern railways must expedite the movement of traffic.

Today there is a growing demand for more frequent service . . . shorter, quicker stops . . . less delay at entrance and exit . . . a speedier getaway.

All of these requirements are met to an efficient degree by the use of complete protective and convenience-promoting devices . . . the Safety Car Control Equipment.

Safety Cars assure accelerated transportation—properly safeguarded.

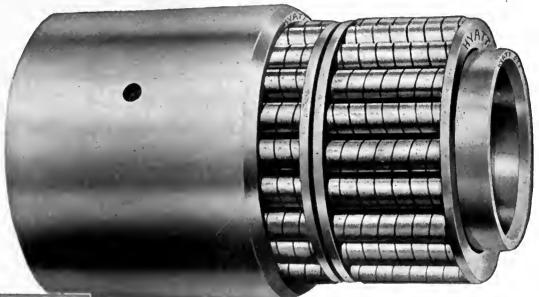


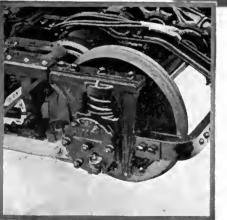
SAVING and SERVING -the Hyattway

THE many annoyances and power-waste of friction bearings may be banished forever with Hyatt Roller Bearings in your ear journals.

Smooth starts, rapid pickups, quiet and easy running are further Hyatt contributions to greater passenger comfort, punctual service and economical operation.

In Hyattized journal boxes the sturdy Hyatt bearings rotate with the wheels in a natural, easy motion and, by reducing friction and drag, they cut power costs appreciably.





The only attention Hyatts ever require is an occasional oil inspection and replenishment at infrequent intervals. Hyatt journal boxes are installed to keep the cars busy earning profits instead of wasting time in repair shops.

The many advantages and economies to be derived from the application of Hyatt Roller Bearings are worth investigating. Every A. E. R. A. requirement for standard equipment or replacement is met.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

HYATT

OLLER BEARINGS

PRODUCT OF GENERAL MOTORS



Carnegie Wrought Steel Wheels for electric railway service are multiplelife wheels. Which means that when the ordinary wheel is worn out and ready for the scrap heap, the multiple-life wheel is still good for many years of service. The cost of reconditioning the contour is trifling compared with the cost of a new wheel. A special process of rolling and forging under enormous pressure insures a homogeneous structure, free from irregularities that might cause failure. Defects are rolled out and mileage rolled in.

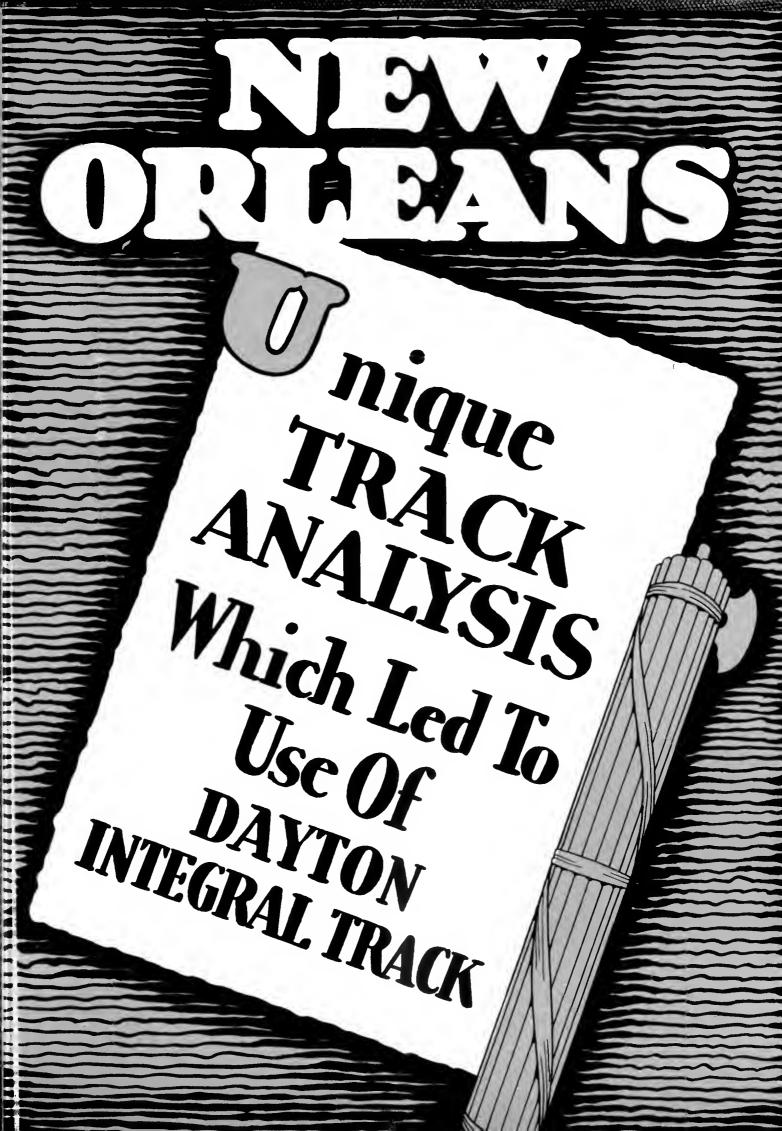
In city service, Carnegie Wheels have an additional advantage in that cars may be speeded up with safety over crossings, with less possibility of damage to special track work.

Operators who figure on a cost-per-mile basis will find Carnegie Wrought Steel Wheels the outstanding value in the wheel market today.

Booklet on request.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation
CARNEGIE BUILDING ∞ PITTSBURGH, PA.







New Orleans Public Service, Inc., has developed a unique and comprehensive method of taking care of track maintenance.

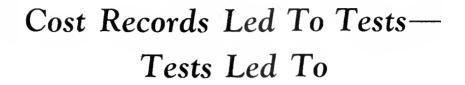
This method not only makes certain that maintenance is kept up, but also records exact cost figures which make possible detail study of maintenance required by every type and age of track in use.

It was this type of study which convinced New Orleans Engineers of the need of better paved track.

None of the types of track they were using fully met their needs. These records proved conclusively that not only was the life too short, but maintenance mounted year by year until the track was eating its head off.

Certain types showed, in a very moderate period of years, maintenance costs equal to or greater than the original cost of track.

The next step was to test other types of track. These tests led to the Dayton Integral System of Track and Paving Structure.



THE DAYTON INTEGRAL SYSTEM

By scientifically exact methods, New Orleans Public Service, Inc., went after the matter of track maintenance cost—track life.

Finding maintenance excessive and life too short, they immediately set to work to find better track.

Again they used scientific methods. Tests worked out and performed with great care led to the utilization of the Dayton Integral System of Track And Paving Structure.

This system combines track and paving into a unified durable structure. It saves concrete—provides long life with no major maintenance at all.

THE DAYTON
MECHANICAL TIE CO.
DAYTON, OHIO



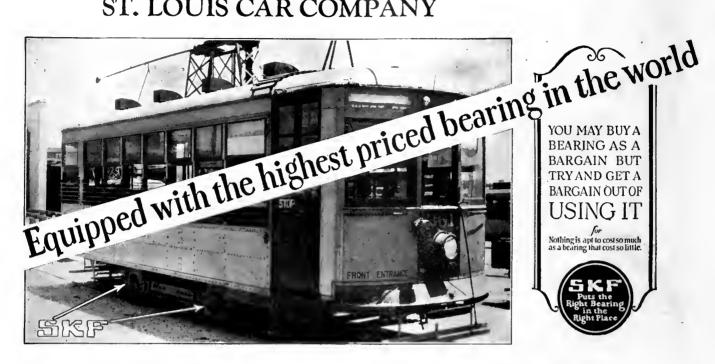
railway performance, economy, comfort and profit TIMKEN WORM DRIVE TRUCKS FOR ELECTRIC RAILWAY CARS

THE TIMKEN-DETROIT AXLE COMPANY DETROIT, MICHIGAN



ANOTHER APPLICATION OF **5KF** BEARINGS ON THE STREET RAILWAYS OF AMERICA BY THE

ST. LOUIS CAR COMPANY



SKF Bearings on Journals and Motors Satisfy Public and Reduce Operating Costs

NE of the most forceful factors enabling street railway companies to successfully meet the challenge of newer methods of transportation is improved rolling stock. And a two-fold aid towards this betterment are SIGF Journal Bearings. Not only do they insure quicker, smoother and easier riding for the public but their operating economies are distinctly traceable on the balance sheets.

For several years SIGF Anti-Friction Bearings have been giving a successful record of performance on the motors and journals of the above car. The Master Mechanic of the road says: "It takes rough and uneven track with less oscillation than other cars of the same type and the riding and running qualities of the car are superior to other single truck safety cars we are operating."

5KF INDUSTRIES, INC., 40 East 34th Street, New York, N. Y.



Ball and Roller Bearings

328



All motor coaches of the St. Louis Public Service Co. are exclusively Goodyear-equipped

1,800,000 Bus Miles Per Year in St. Louis

With 52 motor coaches totaling 150,000 miles per month, and with 312 Goodyear Tires in daily service—the St. Louis Public Service Company has an exceptional opportunity to judge tire performance.

Among these Goodyear Tires they find many which travel better than 30,000 useful miles. The top mileage recorded is 40,626.

But the more important fact about Goodyear Tires is their uniformity in delivering satisfactory service.

Certainly this is due, in part, to Supertwist—the special cord which is extra-elastic—and

puts added vitality into every Goodyear Tire.

It is due, also, to the Goodyear All-Weather tread which—in addition to powerful traction on hills and wet pavements—delivers exceptional mileage because of its slow, even, economical wear.

The excellence of each feature in a Goodyear tire is bound up in the reliability of the whole. It is the ultimate performance of these tires which has won them a place on the great majority of prominent motor coach fleets, just as it has on the fleet of the St. Louis Public Service Company.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service



As Harmonious as its name



The Westinghouse Pneuphonic Horn is available in various types and sizes to produce different tonal qualities, and in combinations for producing a pleasing chime effect when desired. Write for descriptive literature and prices.



The Past Performance of Yellow Equipment sold Washington Rapid Transit on the New

39 passenger Z-240





HE Washington Rapid Transit Company of Washington, D. C., rank as one of the early pioneer bus operators in the East.

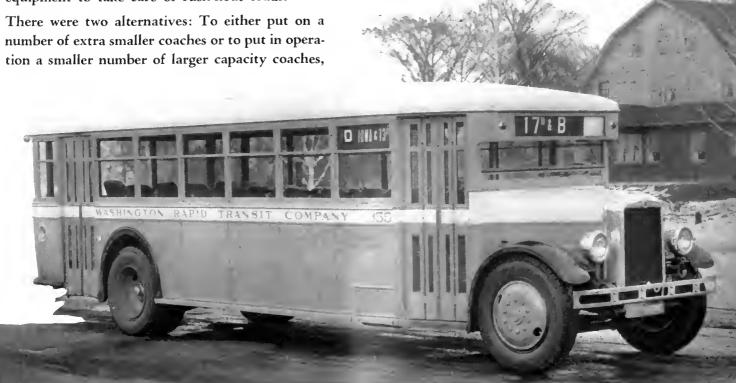
In October, 1927, after having operated buses for 6 years, an extensive survey was made of the operating and maintenance costs of the various makes of equipment in use, with the result that 31 additional Yellow Coaches were secured and placed in operation—28 Z 29-passenger coaches and 3 X 21-passenger coaches.

In the fall of 1928 it was decided to add additional equipment to take care of rush-hour loads.

Again the company made a careful survey of the operating and maintenance costs of their equipment and found that the Yellow Coaches, in use had from the day they went into service, increased revenue 10 per cent and reduced operating and maintenance costs far below the equipment they replaced, even reducing shop personnel, so easily were they serviced.

This record of performance, so typical of Yellow Coach fleets, supplied the answer when additional equipment was needed for peak hour service. The company promptly ordered 8 of the new large capacity, Z-240, 39-passenger City Service Coaches.

Again, performance and knowledge gained by experience had won another repeat order for Yellow.





Already the Z-240 has Proved the Wisdom of Selection

Only a few short months in service, yet ample time in which to judge.

Satisfied with maintenance and appreciating the value of standardization, the Washington Rapid Transit Company is finding their new Z-240's all that they expected.

During peak hours these coaches run on an express schedule carrying passengers without stops to points outside the loading area.

During the off peak periods the coaches are used for sightseeing and profitable charter business.

Responsible for successful performance are the same factors that influenced the purchase of the original fleet of Yellow Coaches—factors checked against the operations of other companies using a wide variety of different makes.

- 1. Cost per mile of operation.
- 2. Cost per mile of maintenance.
- 3. Gasoline-miles per gallon.
- 4. Life of motor and other major units.
- 5. Accessibility of major units in dismantling and assembling.
- 6. Tire mileage.
- 7. Seating arrangement and riding quality of coaches.
- 8. Durability and life of body.

Through their dependable, economical operation, Yellow Coaches are everywhere placing motor coach transportation in the United States and Canada on a sound and profitable basis.

Pontiac, Mich.



The Texas Company announces

With the acquisition of the Penniman patent rights and in combination with other rights, The Texas Company is in a position to offer to the Electric Railways of the country a new power-saving principle of lubrication.

Speaking conservatively, a 20 per cent saving in power is assured -33 per cent has been attained.

Executives of Electric Railways are invited to correspond with us to secure complete data.

THE TEXAS COMPANY

Lubricating Division

Dept. L, 17 BATTERY PLACE, NEW YORK CITY

NOTE—these savings do not require any radical change in present methods

hese photos from tell an of track



SHOWING the application of Carey Elastite System of Track Insulation on the Hydro-Electric Railway lines, at Windsor, Ontario, Canada.

ONTARIO interesting story reconstruction work...

CAREY Elastite System of Track Insulation is an important part of the betterment program of Hydro-Electric Railways, Windsor, Ontario. For, in this improved traction development, the officials of this Canadian railway have found a logical, economical way to minimize track noises and to keep next-to-therail paving smooth and unwrinkled.

More than two hundred cities are using Carey Elastite System of Track Insulation with the same perfect results. For new tracks, for reconstruction work. A saving in railway maintenance, a route to faster schedules—a guarantee of smoother riding and better service to patrons. If you are planning any track construction work, it will be to your advantage to have our representative call and give you the facts on this advanced system of track insulation.



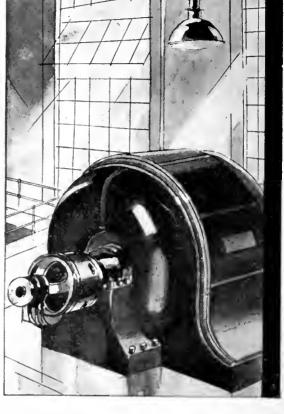


A preformed asphaltic compound, reenforced with asphalt-saturated fibres. A moisture-proof, shock-absorbing cushion between the rails and paving.

COMPANY, Lockland, CINCINNATI, OHIO



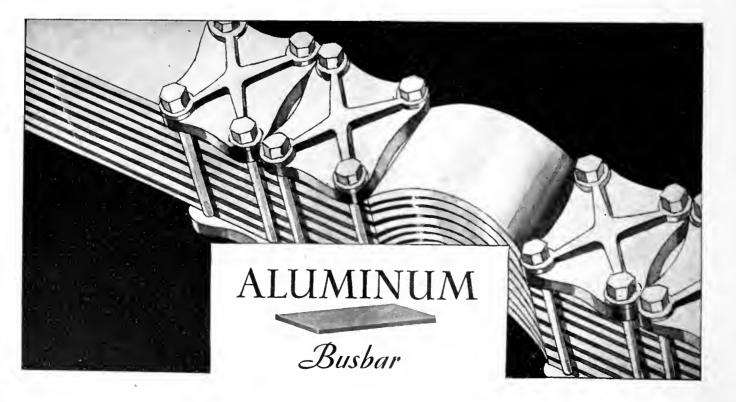
Aluminum Busbar reduces the cost



THE fact that the most important nations of Europe have standardized on Aluminum Busbars as the most satisfactory and economical material for transmission purpose, has only a collateral interest here in America.

But some American transmission engineers took advantage of the economy inherent in Aluminum Busbar many years ago and their use in America has grown year by year until today Aluminum Busbars have wider acceptance in this country than at any other time in our electrical history. The booklet, "Aluminum Busbars," contains useful tables of weights, carrying capacities and physical properties, together with photographs of various installations. Please send for your copy.

ALUMINUM COMPANY OF AMERICA 2463 Oliver Bldg., Pittsburgh, Pa. Offices in 19 Principal American Cities



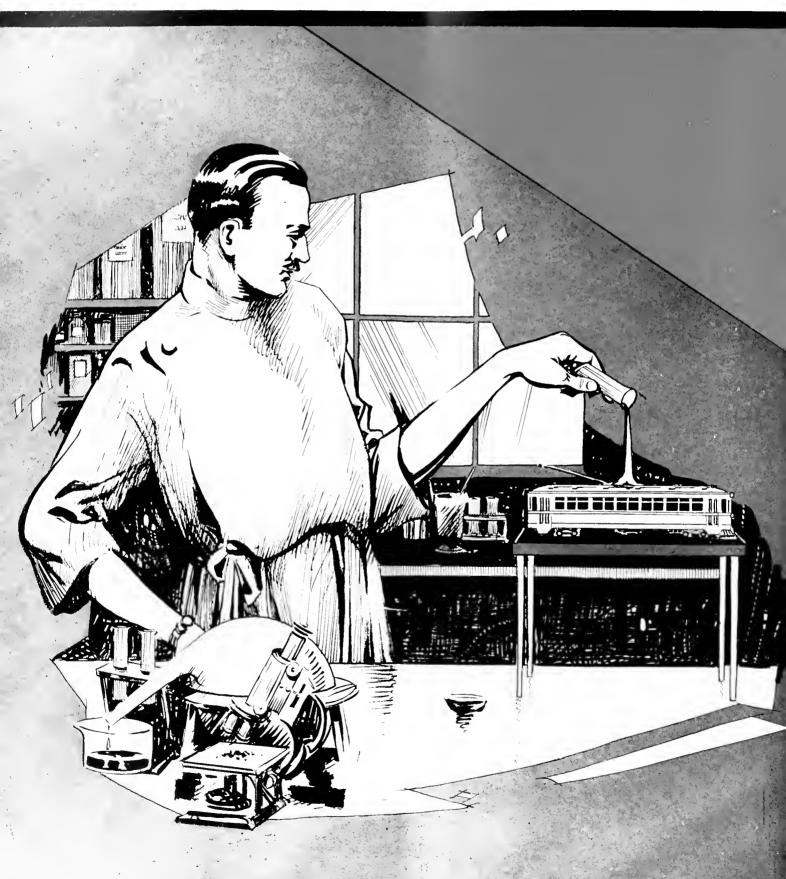
dovelopment







LET US EXPLODE



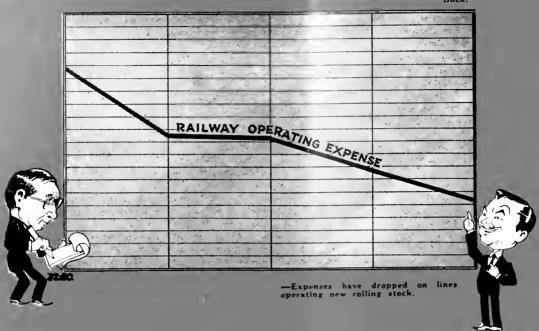
THE TEST-TUBES

TEW rolling stock has saved the industry. New rolling stock bought today—and tomorrow—will keep the industry forging ahead.

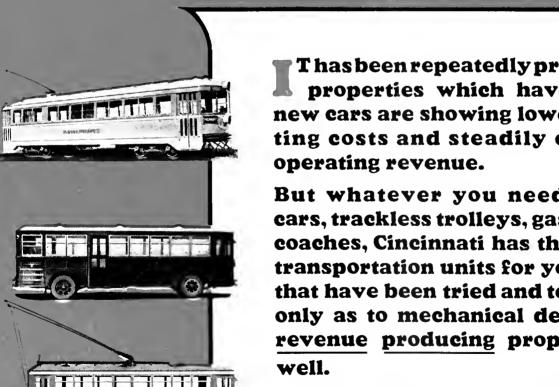
But make sure that new rolling stock you buy is <u>tested—tried</u>,—make sure that all the explosions ceased when it left the factory.

Cincinnati explodes its own test tubes. We are constantly researching, planning, trying, testing.

That's why our customers RE-ORDER—why our reputation for building revenue producing vehicles is a mark for others to try for.



New Cars Reduce Operating Costs New Rolling Stock Is NECESSARY



Thas been repeatedly proved that properties which have bought new cars are showing lower operating costs and steadily climbing

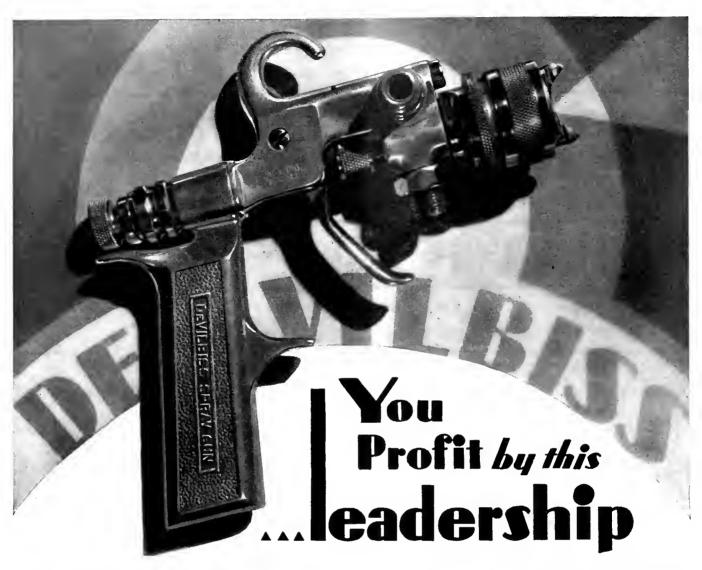
But whatever you need-street cars, trackless trolleys, gas-electric coaches, Cincinnati has the correct transportation units for you. Units that have been tried and tested, not only as to mechanical details, but revenue producing properties as

THE CINCINNATI CAR CORPORATION Winton Place Cincinnati, Ohio

THE WORLD'S LARGEST PRODUCER OF RUBBER PRESENTS THE WORLD'S FINEST HEAVY-SERVICE







DeVilbiss leadership in the spray-painting and sprayfinishing equipment industry has a definite every-day value to you, because DeVilbiss leadership is based upon the efficiency of DeVilbiss equipment in the hands of the user.

The complete scope and variety of DeVilbiss equipment lines, the magnitude of the DeVilbiss manufacturing operations, the pioneering done for the entire industry by DeVilbiss research and engineering departments, are all qualifications for leadership, but DeVilbiss leadership is recognized today principally because DeVilbiss equipment saves and makes money for those who use it.

You will find that the knowledge, experience, and manu-

facturing economy in the DeVilbiss organization have been directed specifically against your individual painting or finishing problem. When you buy a DeVilbiss spray outfit you get more than something to take the place of a paint brush—you get an outfit designed to bring to your own operation the maximum advantages of a new and better way to apply protective and decorative coatings.

Let us tell you about DeVilbiss outfits and installations especially designed for electric railway finish maintenance work. In your field, operating and maintenance costs are sharply affected by the character of your finishing equipment, and this counsel, which costs you nothing, may save you much.

Spray guns of various types and sizes.

Pressure feed paint tanks and containers.

Spray booths, exhaust fans, and approved lighting fixtures.

Air compressing equipment.

NEW YORK

DeVilbiss
Spray-Painting System

Air transformers and accessories.
Air and fluid hose and connections.
Complete outfits from the smallest handoperated units to the largest industrial
installations.

THE DEVILBISS COMPANY , 272 PHILLIPS AVENUE , TOLEDO, OHIO

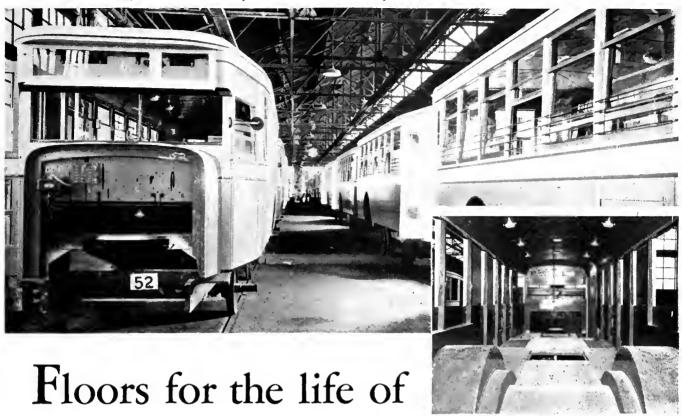
Sales and Service Branches

PHILADELPHIA CLEVELAND DETROIT INDIANAPOLIS SAN FRANCISCO WINDSOR, ONT.

CHICAGO ST. LOUIS

Direct factory Representatives in all other territories

WATER-PROOF, SKID-PROOF, LIGHT WEIGHT, LONG-LASTING AND ECONOMICAL



these buses ... without maintenance costs

At one low cost these Masticoke floors will last for the life of the buses. Masticoke was chosen by one of the largest bus operators* as the most economical, serviceable material for this purpose. These floors will never have to be repaired. First cost will be the last cost. The thousands and thousands of feet that will tread these floors will not wear them out nor will vibration crack them.

MODERN BUS FLOORING THE

This light weight bus flooring is tough and resilient and long-lasting. Its natural dark gray color will add materially to the appearance of your buses. J-M Masticoke

will help to keep your buses looking spic and span.

J-M Masticoke is skid-proof and water-proof. It is sanitary and odorless. It is easily cleaned by flushing with water. It is fire-retardant and acts as an insulation against cold.

J-M Masticoke, long in service on railroads, is being used by more and more bus fleet owners to reduce floor costs. Why not mail the coupon for complete information? *Name of operating company on request.



BUS TRANSPORTATION



J-M Masticoke, an asphalt composition, is applied in a semi-liquid form to either metal or wood sub flooring. The upper picture shows an actual bus sub flooring of wood. The lower picture shows the smooth, even surface of J-M Masticoke as applied on the same bus.

JOHNS-MANVILLE CORPORATION

Motor Bus Division New York, Chicago, Cleveland, San Francisco, Toronto

(Branches in all large cities)

Please send me full particulars on J-M Masticoke Bus Flooring.

......



Union Metal Fluted Steel Poles used for trolley span wire support and distribution service, Joseph Campan Street, Detroit.

THE UNION METAL MANUFACTURING CO.

send you further information.

General Offices and Factory, Canton, Ohio Sales Offices—New York, Chicago, Philadelphia, Cleveland, Boston, Los Angeles, San Francisco, Seattle, Dallas, Atlanta

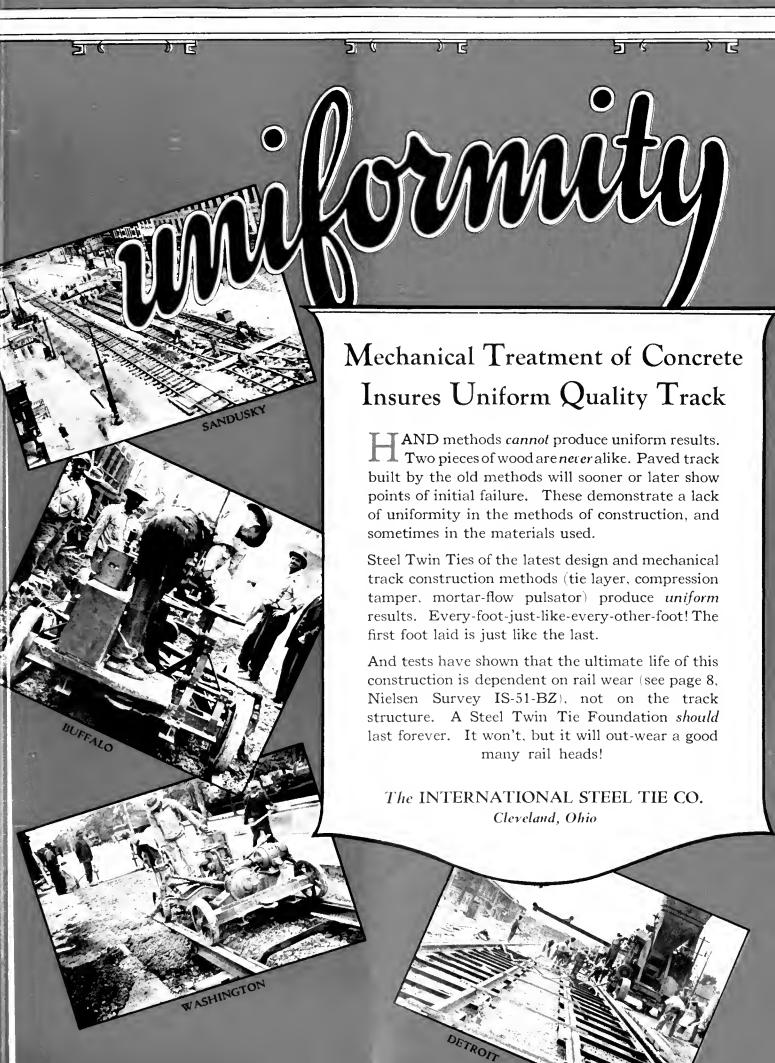


Distributors:
Graybar Electric Company, Incorporated General Electric Merchandise Distributors

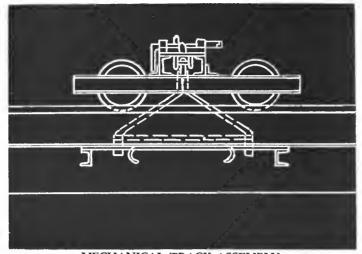
Offices in all principal cities

UNION METAL DISTRIBUTION AND TRANSMISSION POLES





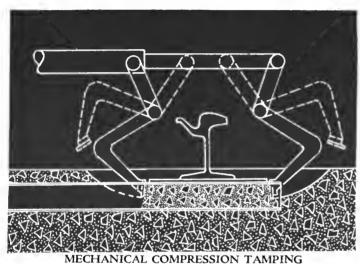
UNIFORMITY in the ASSEMBLY OPERATION



MECHANICAL TRACK ASSEMBLY

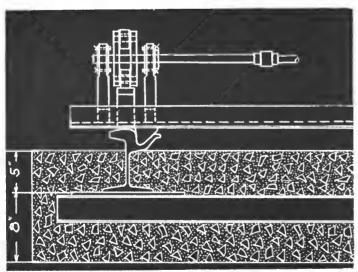
TIES are lifted by one man with the D.S.R. Track layer, and bolted to the rail. Bolts are tightened. For this operation one man takes the place of four, does faster, more accurate work. The D.S.R. Track Layer is adjustable for various rail heights.

UNIFORMITY in the TAMPING OPERATION



ONCRETE is compressed under the tie plates, assuring perfect bond, absence of voids. The tamper is operated by one man, eliminating all hand tamping labor, giving uniform results throughout the entire track structure.

UNIFORMITY in the FINISHING OPERATION



MECHANICAL "MORTAR-FLOW" BONDS STEEL
TO CONCRETE

THE "mortar-flow" pulsator rests directly on the rail and gives the track structure, mechanically, 4800 impulses per minute, causing a mortar flow which unites the steel of rail and ties, and the concrete, in perfect bond. Test samples taken after concrete is set shows absolute absence of even minute air pockets.

The INTERNATIONAL STEEL TIE CO.

Cleveland, Ohio

"Canned Experience Make use of the other man's experience

That old saying

That old saying

That old saying

That old saying

about experience being ound that

eacher is recited without be of

reacher us recited experience on the

most that experience experience on the

various men as even experience

other med rey for the experience

"canned ready for the experience That old saying nany expensive lessons? share nany expensive lessons? how know that a large twork Do you know the seachhology the field of science, ad in the field of science at the scien GRAWS ?

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28 you wish.

28 you want for each as many as you wish.

Read them for ten days free keep those you don't want.

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Paid in full within six months.

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same as for cash.

Richey-

Electric Railway Handbook Second Edition, 798 pages, flexible, pocket size, 528 illustrations, \$4.00

528 Illustrations, \$4.00

A thoroughly revised reference book of practical data, formulas and tablea for the use of operators, engineers and students. It gives the essential reference data on all phases of electric railway construction and operation. It presents: (I) Data on subjects which come up in everyday electric railway practice. (2) Material of service to the non-technical manager or operator. (3) Reference material on electric railway practice for those who are specializing to other or allied lines.

Harding-

Electric Railway Engineering
Third Edition, 480 pages, 6x9, 248 illustrations,
\$5.00

A thorough revision of this standard work on the theory and practice of electric railway engineering. The book covers the principles of train operation, power generation and distribution, equipment and types of systems.

Kurtz-

Lineman's Handbook

550 pages, pocket size, flexible, llipstrated, \$4.00 The first book written expressly for linemen, forsmen, and other employees of line departments. The book meets the growing need for a pocket volume of construction and maintenance data, procedure, and methods. It presents hundreds of kinks, shortcuta, expedients and time- and worksaving methods, as well as acorea of useful diagrams, tables, and formulas for the lineman.

Standard Handbook for **Electrical Engineers**

Fifth Edition, 2,100 pages, 4½x7, flaxible, illustrated, \$6.00

A widely-known encyclopedia of electrical engineering. The book covers every branch of modern electrical engineering. It is complete and reliable, and so carefully and fully indexed that its information is readily accessible.

Croft-

American Electricians' Handbook

823 pages, pocket size, 900 illustrations, flexible, \$4.00

The book is a reliable, useful handbook for wiremen, contractors, linemen, plant auperintendents and construction engineers. It alms to give the practical man the facts on apparatus, materials and installation which he needs in his daily work. It is practical from cover to cover.

Choose the books you want to see and just mail the coupon

Blake and Jackson-

Electric Railway Transportation Second Edition, 437 pages, 6x9, 121 lilustrations, \$5.00

A second edition of this widely known book on the transportation side of the electric railway business — getting the cara over the tracks — increasing the traffic — collecting the farca—and selling service in the face of modern conditions. Particular consideration is given to the place of the bus in modern transportation.

King-Railway

· Signaling 369 pages, 6x9, 349 Illustrations, \$4.00

\$4.00

A completely adequate book on all phases of modern railway signaling. The book describes fully the construction, installation, operation and maintenance of signaling equipment, and presents a thorough discussion of priociples.



Nash-

Economics of Public Utilities

413 pages, 6x9, \$4.00
This book presents the essential facts and the most mature views upon the underlying financial and economic phases of public utility companies, with particular emphasis on electric railways, electric light and power companies and gas companies.

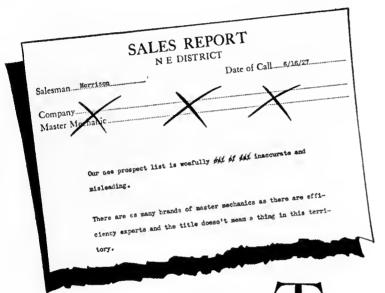
It discusses every angle of the public utility as a business and treats thoroughly such subjects as capitalization, investment features, franchises, regulation, valuation, depreciation, taxes, rates, service, accounting methods, public relations, etc.

Mail this coupon to see these McGraw-Hill books

McGraw-Hill Brok Co., Inc., 370 Seventh Avenue,
New York.
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Richey's Electric RailwayCroft's American Electri- Handbook, \$4.00. cians Hendbook, \$4.00.
Harding's Electric Railway Engineering, \$5.00. Blake and Jacksons' Electric Railway Transportation, \$5.00.
Kurtz' Linemen's Hand- book, \$4.00. King's Railway Signaling,
Standard Handbook for Nash's Economics of Pub- Electrical Engineers, \$6.00. lie Utilities, \$4.00.
I agree to return such books as I do not wish to keep, postpaid, or to remit for them within 10 days of receipt.
Name
Homs Address
City
Position
Name of Company W.E.R.I.

This is one of a series of McGraw-Hill advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Is his title backed up with real buying authority?

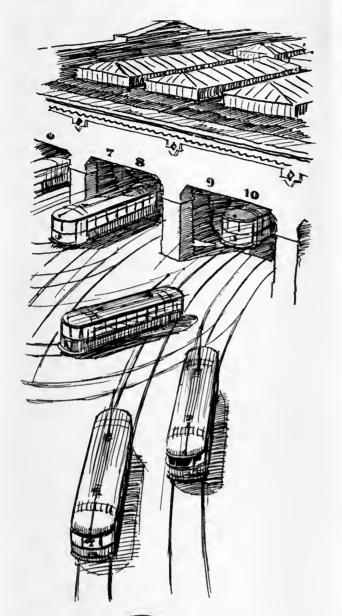


What can you expect from an industrial advertising campaign that is planned to cover a prospect list built on this basis?

HE one reliable method of running down the real buyers is to seek them by actual operating responsibilities. The important thing is not what they are called but what they do.

This principle comes out of McGraw-Hill's years of experience in circulation and editorial service throughout American Industry.

The confusion of titles in industry is discussed on pages 29 to 33 in *Industrial Marketing at Work*. A copy of this book will be delivered to executives interested in selling and advertising to industry.



WHEELS

The foundation of your rolling stock

Do your periodic inspections reveal frequent flat wheels and defective flanges? "Standard" Wheels are made of that stern stuff which stands the gaff of hard service.

Rolled Steel Wheels Armature Shafts Axles and Springs



"FOR EVERY TYPE OF CAR



IN EVERY TYPE OF SERVICE"

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

CHICAGO ST. LOUIS BRANCH OFFICES:
NEW YORK
PORTLAND
WORKS: BURNHAM, PA.

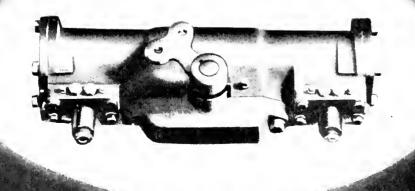
RICHMOND SAN FRANCISCO



Consolidated Door Operators are being selected by more and more properties. Improvements in design and superior operating qualities are winning this recognition.

Special features - by-pass for safety - duplex valve for simplicity - treadle operator for speed.

Made in various types and styles to meet every requirement.

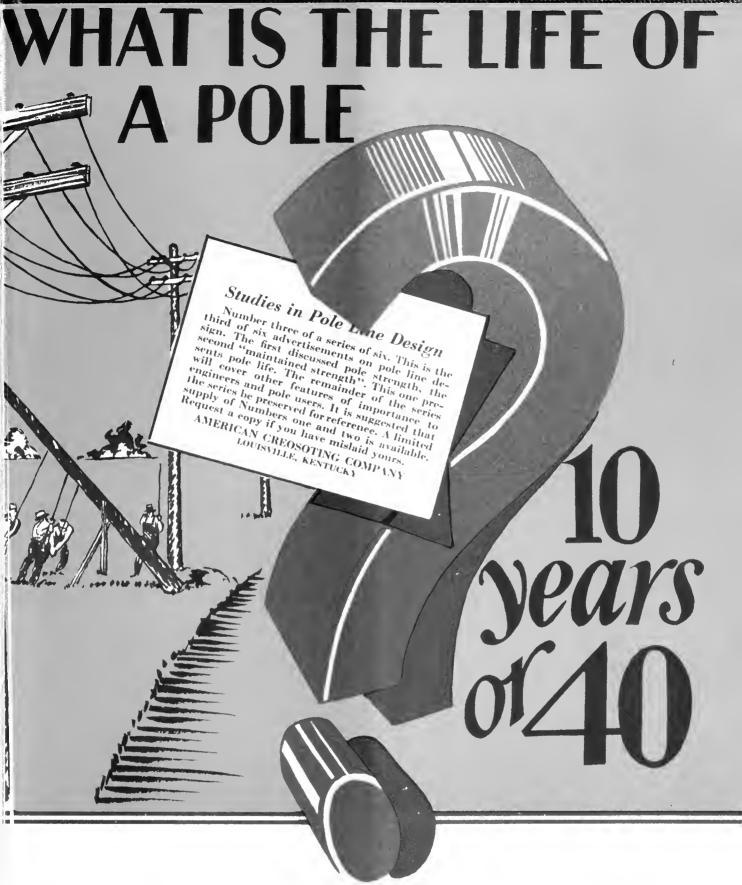


CONSOLIDATED CAR-HEATING COMPANY, INC.

NEW YORK

ALBANY

CHICAGO



lust a Good Pole be Scrapped When Conditions Require a Change?

Why Not Reset It in a New Location?

The Third Big Factor in Pole Line Economy

The last of the three big factors in selecting the most economical pole for a given line is the probable life of the pole. The initial strength—which determines the size and spacing required—and the rate of deterioration in strength—which affects the factor of safety—are the other two big considerations. These were discussed in previous advertisements in this series,

What is the Life of a Pole?

The life of a pole is the period of its useful service. It may end before the pole actually breaks, for if it has to be removed as no longer safe its service is finished. A variety of causes may contribute to produce the unsafe condition and end the life of a pole. In addition to decay—discussed in the last advertisement—fire, insects and birds are the most common of these causes. Changing conditions which may increase or decrease the load also serve to limit the life of some poles that would otherwise render many years of useful service. This feature is further discussed in a later paragraph. Any pole claiming long life must, therefore, be tested in the light of all these limiting factors.

Do Wood Poles Vary Greatly in Life?

Many untreated poles subject to bad conditions have become unsafe in less than five years. Poles that are better protected against deterioration will, of course, last much longer. Thousands of ercosoted poles have served 25, 30 and more years. Since the labor cost of setting a pole, placing the cross arms and stringing the wire is approximately equal to the more expensive types of poles and is independent of the probable life, it is obvious that a pole with a very short life is uneconomical even though its first cost is very low.

Is Minimum or Maximum Life to be Used in Pole Studies?

Since all the poles in the line do not fail or become unsafe at the same

time, the question is often raised as to how to determine from past service records what life to assume for a given type of pole—the minimum or the maximum? Obviously, either of these two extremes would give erroneous conclusions for most of the poles in the line. The only fair basis is to use a weighted average.

Some Pole Types Have Proven Their Life

Experience with untreated poles of various species has conclusively demonstrated the short term of life to be expected from any of the woods still commercially available. The life of butt-treated poles is also fairly accurately known. While better than untreated poles, they usually require careful watching after ten years, and twenty years is commonly taken as the estimated life for the best grades of poles in this class.

Others are Still Making their Record

On the other hand, full length pressure treated creosoted southern yellow pine poles, of which the Amereco pole is the leading example, cannot yet be positively limited as to their life for they have been in commercial use only about 35 years. So many of the earliest poles set are still in service and so few of the later ones have failed that the fair average life is still a matter of estimate. Based on experience with such poles both in this country and in Europe and experience of American engineers with creosoted wood for railway cross ties and bridge timbers, it seems conservative to place the average life for an Amereco pole between 30 and 40 years, depending on the severity of the service in which it is placed. Complete service records will probably increase this estimate.

How They Resist Deterioration

The pure creosote oil injected into the cells of the wood by pressure as in the America process poisons decay producing fungi and prevents their development. It is also repellent to white ants and other insects. The elimination of insects removes the primary cause for attack by birds. When a creosoted pole is ignited the oil burns first, as in a wick, and deposits a coat of carbon on the surface which shuts off oxygen and retards further combustion.

Why Not Reset Good Poles?

It is, of course, wasteful to spend 50% or more of the cost of a pole to set one that has only a few years of life remaining. But if a pole with an estimated life of 40 years must be removed from a line in 10 years on account of changed conditions, it certainly pays to relocate that pole in another line. Such practice is not only economical, but is a commendable step toward closer utilization of forest products.

Some of the Creosoted Pine Life Records

Hundreds of cases might be cited to support the claims of long life. Typical facts include the following:

The Washington & Norfolk line of the A. T. & T. Company built with creosoted pine poles more than 30 years ago is reported in "good as new" condition.

The Public Service Company of New Jersey reports crossoted southern yellow pine poles in its lines 32 years and "good yet".

None of the creosoted pine poles installed by the Louisville Railway Company had been replaced at the end of the 22 years of service.

The Pennsylvania Electric Association Overhead Systems Committee report gives the anticipated life of creosoted southern yellow pine as 35 years.

A paper based on the experience of the Carolina Power & Light Company attributes a life of 40 years to these poles.

For additional copies of this series of studies of pole line design or for quotations and information on AMCRECO Creosoted Southern Yellow Pine Pules, address the nearest sales office.

AMERICAN CREOSOTING COMPANY

COLONIAL CREOSOTING GOMPANY



GEORGIA GREOSOTING GOMPANY

LOUISVILLE ~ KENTUCKY

SALES OFFICES

332 S. Michigan Ave., Chicago 350 Madison Ave., New York City 401 W. Main St., Louisvitte, Ky. Brunswick, Ga. Bogalusa, La.



Half-way to a brush



One side of moulding department

HERE is one of the machines that produces the first semblance of a carbon brush—after more than 40 days of continual, uninterrupted manufacturing processes applied to raw materials.

Into this machine a milled and blended mixture of carbon and pitch is fed. The hydraulic press moulds this into large blocks. Pressures of 15 to 20 tons per square inch are necessary.

The products of these presses, however, are not brushes. Neither in size nor shape are they suitable. In order to give them the proper electrical and mechanical characteristics, baking, and other operations are required.

At this stage we are just about in the middle of

the manufacturing process—over 40 days have passed since the lampblack was manufactured and approximately as much more time will be required to turn these raw blocks into finished brushes of such perfection that they can bear the NCC Pyramids and carry the Silver Strand Cable.

The National Pyramid Brushes we would ship you today are sawed from blocks that were made months ago, blocks that have passed through many other scientifically controlled operations. On receipt of your order, your brushes are made exactly to your specifications from brush blocks stored in our several factories. That is how we are able to ship so promptly.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.





Living for and not off the Industry....

This expression, used recently of Electric Railway Journal by a well-known electric railway executive,* expresses exactly the guiding policy of the paper during its more than 40 years of service to the Industry.

In those seven words lies the reason why Electric Railway Journal has always been received in the light of a friend and counselor. Behind them is the spirit which was responsible for the recent presentation to this paper of the first Associated Business Papers' Award established in 1927 for Outstanding Editorial Service.

Electric Railway Journal

*Mr. Walter A. Draper, President, The Cincinnati Street Railway Company.

years in the severest service



.. leading elevator, crane and motor builders have standardized on SUPER-MICANITE



The use of commutator segments and rings of Super-Micanite, in both manufacture and repair work, is growing by leaps and bounds. In the short space of three years Super-Micanite has become the

outstanding bonded mica insulation. It assures longer life and reduced maintenance even under the most severe operating con-

Overloads, high working temperatures, exposure to dirt and fumes and the inevitable arcing in such service will not cause deep pitting between segments as is likely when shellac bonded mica is used.

Decomposition products of the Super-Micanite binder, formed below the carbonization point are neither corrosive nor conductive. High temperatures employed when soldering leads to commutator bars have no detrimental effect on Super-Micanite.

Detailed advantages of this modern bonded mica insulation are given in our Super-Micanite Bulletin No. 111. Send for a copy.





New York: 200 Varick Street

Chicago: 542 S. Dearborn St.

Works: Schenectady, N. Y.

Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal







It is not enough to know that a motor oil or gasoline is good. These properties, though tremendously important, are not all of the requirements that you should demand from motor coach fuel and lubricants.

If you would get the most mileage from gasoline, the most efficient lubrication from your motor oil—select a fuel and motor oil that work in harmony. Red Crown Gasoline and Polarine Motor Oil form an ideal combination—a gasoline that gives power, mileage and complete combustion—a motor oil that is not too heavy, yet is rich and sturdy, supplying thorough,

efficient lubrication to the motor.

Red Crown and Polarine have been refined to work in harmony, to give separately and together, maximum service in the internal combustion engine. Working together they give that perfectly balanced performance which insures efficient service and low cost operation.

Have our engineers make a test of Red Crown and Polarine in your motor coaches. Compare the combined operating cost of this gasoline and motor oil with the combined operating cost of any other fuel and lubricant and let the figures speak for themselves.

STANDARD OIL COMPANY (Indiana)

General Offices: 910 S. Michigan Ave.

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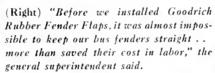


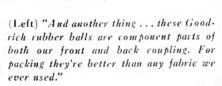


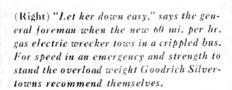
(Left) Over 600 buses operated by the Philadelphia Rapid Transit, Philadelphia, Pa., are equipped with Goodrich Silvertowns. Photo shows operator checking air pressure on a bus scheduled for a fast run.



(Left) "Metal to metal contact won't do," said P. R. T. officials. "Top leaks have to be eliminated." And they were with Goodrich Rubber Seam Bands!













Rubber in the Bus Industry

WHEN you have learned to appreciate the uninterrupted service value of Goodrich Heavy Duty Silvertowns you have learned just one of the many advantages Goodrichhas to offer you.

Goodrich manufactures rubber for the bus industry!

Among the items Goodrich makes are tires, tubes, seam bands, door flaps, fender flaps, coupling balls, air, water, steam and radiator hose, fan belts, rubber cement, floor matting, etc.

Think of Goodrich when you think of rubber for the bus industry.

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ont.

Goodrich HEAVY DUTY Silvertowns for Double Deckers



UPERIOR CATIONS

SEVEN SUPERIOR SPECIFICATIONS

BUILT INTO EVERY HEAVY DUTY SILVERTOWN

1. Heavily insulated stretch-matched cords.

- Additional adhesion—from greater insulation between outside plies.
- 3. Heavy twin beads for better rim seating.
- 4. Extra gum fillers between plies for longer tire life.
- 5. Heat-resisting, interlocking cord break-
- 6. Tread designed correctly for heavy duty
- 7. The whole tire toughened by the famous Goodrich "water cure."

Goodrich Heavy Duty Silvertowns on the front and rear of P. R. T. wrecker-snow fighter? Of course. Note how the sturdy treads stand out in this unretouched photograph.

Then further tests with dual pneumatic rears added so much comfort, speed and uninterrupted service to P.R.T. travel that two hundred double deck buses are to be Silvertown equipped all around!

Every bus operator owes it to himself to let a Goodrich salesman go into the detail of operating costs and uninterrupted service with him on Goodrich Heavy Duty Silvertowns.

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ontario.

Off with the slow, old solids . . . on with the new Goodrich dual pneumatics! More speed, more comfort and uninterrupted tire service.

R. T., one of the largest bus operators in the United States, have been satisfied users of Goodrich Heavy Duty Silvertown Tires for more than six years.

And now, even on the double deckers they go . . . these sturdy Goodrich Heavy Duty Silvertowns.

Tested first on front wheels, they made steering easier for the drivers ... they cushioned motors over some of Philadelphia's worst paved streets

of Philadelphia's worst paved streets . . . gave uninterrupted service and noticeably reduced motor adjustments and repairs.

Mileage? 75,148 bus miles without a delay!

Goodrich



Silvertowns

SPECIFY GOODRICH ON YOUR NEXT BUS

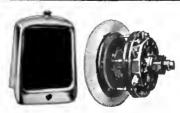
HE TWO RADIATORS which cool the motors in the Twin Coach are products of the

LONG MANUFACTURING CO.
DETROIT MICHIGAN

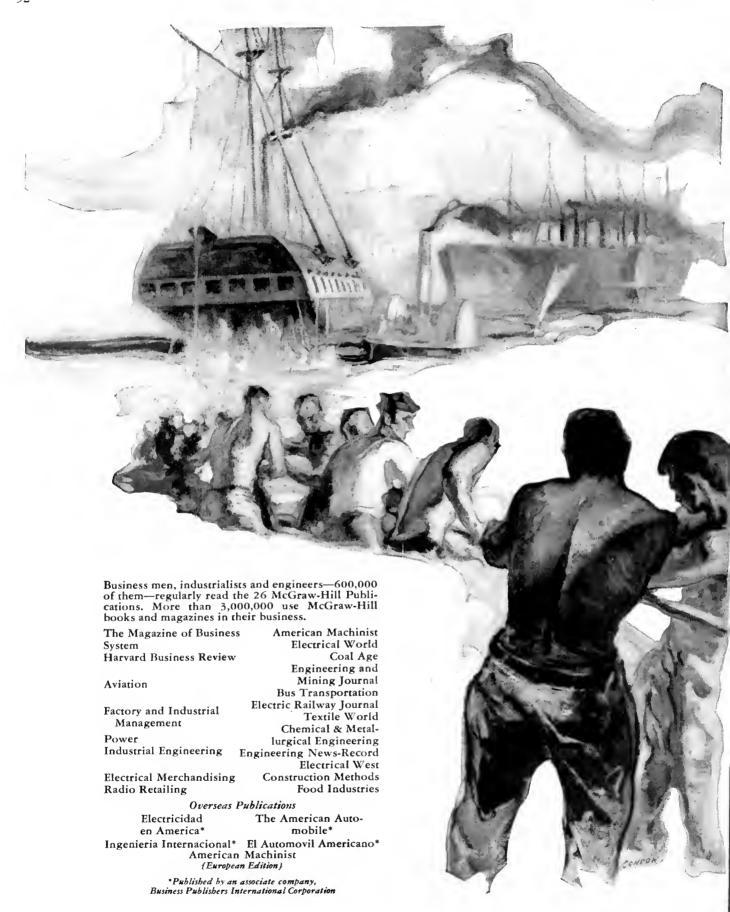


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AUTOMOTIVE RADIATORS



AUTOMOTIVE CLUTCHES



McGRAW-HILI

McGRAW-HILL PUBLISHING COMPANY, Inc., New York - Chicago - Philadelphia





LONG years of trial and failure.
One final tense gripping moment.
Then the click-click-click.

Clearly and distinctly over the first Atlantic cable came Queen Victoria's greeting to President Buchanan. Europe and America joined for instantaneous communication! An ocean barrier eliminated distance conquered weeks cut to split-seconds by Cyrus W. Field. Once again the vision, courage and persistence of a single man without engineering precedents, had overcome old obstacles and made a major contribution to the world's progress.

Space, time, waste the great obstructionists of progress are fast being vanquished today. Overnight,

science and industry are continually turning dreams into realities. This is possible because the united brain power of many men now seizes upon and solves these problems by the free exchange of ideas and of experiences through a highly specialized, scientific and industrial press.

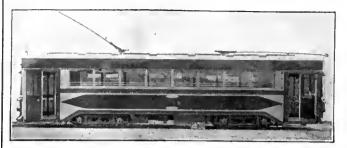
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McGraw-Hill Publications—26 of them —serve industry, engineering and business. They tap news sources; record experience; analyze methods; crystallize opinion; conduct research; view today's events in terms of tomorrow's consequences. And through them month by month industry is able to organize its thinking and co-ordinate its leadership, to quickly gain desired ends without long years of waiting.

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Wilmington's HASKELITE equipped cars



MAKE (G()())

Ten more cars ordered

NCE more HASKELITE equipped cars are re-ordered on an actual performance basis. Last year Wilmington ordered 10 model cars from the J. G. Brill Co. HASKELITE was used for interior side linings, frieze panels, and roofs, since these cars were de-

signed to stimulate the public's desire to ride by appearance, speed, comfort, convenience and safety in operation. How well these HASKELITE equipped cars performed can be judged

by this latest order for 10 additional cars which are practically identical with the first lot ordered. HASKELITE'S extensive use and many years of economical service have demonstrated beyond a doubt the advantages of this light weight, strong, and unusually at-.

tractive material. Write for useful data on the application of HASKELITE and its metalfaced mate, PLYMETL. in street car and bus construction.



Haskelite Manufacturing Corporation

PLYW00]]

120 South LaSalle Street, Chicago, Illinois

RAILWAY REPRESENTATIVES:

Economy Electric Devices Co., 37 W. Van Buren St., Chicago Grayson Bros., 600 LaSaile Bidg., St. Louis, Mo.

Railway & Power Engineering Corp., Ltd., Montreal, Toronto, Winnipeg, New Glasgow.





with Chromalox Strips. Listed as Standard by Underwriters' Laboratories. Delivers 100 per cent output for electric energy input.

RAILWAY UTILITY COMPANY 2241 Indiana Ave., Chicago, Ill.

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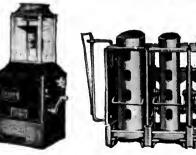
JOHNSON FARE COLLECTING **SYSTEMS**



Johnson Electric Fare Boxes and overhead registers make possible the instantaneous registering and counting of every fare. Revenues are increased 1½ to 5% and the efficiency of one-man operation is materially increased. Quicker boarding of passengers with resultant reduction in running time for the buses. Over 5000 already in use.

When more than three coins are used as fare, the Type D Johnson Fare Box is the best manually operated registration system. Over 50,000 in use.

Johnson Change-Makers are designed to function with odd fare and metal tickets selling at fractional rates. It is possible to use each barrel separately or in groups to meet local conditions. Each barrel can be adjusted to eject from one to five coins or one to six tokens.



Johnson Fare Box Co. 4619 Ravenswood Ave., Chicago, Ill.



As originators of the All Metal Body, Lang offers to the Industry what is admittedly the last word in superbody building.

Lang All Metal Bodies are bound to be more lasting—for metal is more enduring than wood.

Such bodies are more easily serviced —for replacement of panels and other operations are easily made with standardized sections and units.

They are lighter, yet stronger—for

all metal construction assures more strength with less weight.

They are safer—for metal does not burn or splinter, gives instead of breaks, resists impact and provides greater safety to passengers.

Thinner walls permit greater interior width, with consequent added room and maximum passenger comfort.

Such factors are worth a higher initial cost because longer life and lower cost of maintenance more than make up the difference in the long run.

LANG metal bodies Safer-and of enduring quality



Quality that endures... Safety that lasts

The lasting strength and safety and lightness of All Metal construction are now combined with the graceful lines and practical operating utility so characteristic of all Lang built bodies.

Experienced bus operators have been quick to recognize the significance and the important advantages that this achievement makes possible.

Safety is coupled with enduring quality. Maintenance costs are reduced. Hazards through fire and collision are almost entirely eliminated. Body life is extended . . . less depreciation and a greater return on the initial investment.

The Lang All Metal Body is unquestionably the last word in super-body building.

LANG BODY COMPANY, CLEVELAND, OHIO

RECENT **PURCHASES**

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Study These

Features

- 1. Longer life. Metal outlasts wood.
- 2. Lower cost of maintenance.
- 3. Lighter and stronger. Strength without bulk.
- 4. Greater safety. Better protection.
- 5. Thinner walls give more inside room.
- 6. Lower cost in the long

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Just Out!

A book that combines the description of the physical characteristics of the elements of electrification with the analysis of economic problems and the operating performance of both electrification and electric operation. Special emphasis is given to such topics as power supply contracts, overhead distribution systems and economic data.

Electrification of Steam Railroads

By KENT T. HEALY

Assistant Professor of Transportation, Yale University; formerly, Inspector sod Cost Engineer, N. Y., N. H. & H. Ry.

395 Pages, 6x9, 165 Itiustrations, \$5.00.

This book is the result of a recent survey of the electrifications of both Europe and the United States.

Men actively interested in electrification, either as railroad officials or construction engineers will find this book full of usable information. It includes valuable cost data and treats fully of the economics of electrification and personnel organization.

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- I. General Economies of Electrification.
- II. Source of Power for Electric Operation.
- 111. Power Contracts.
- IV. Power Substations.
- V. Distribution Switching and Sectionaliz-
- VI. Overhead Supporting Structures.
- VII. Overhead Contact System. VIII. Dail Distribution System.

- In lat Distribution System.
 Economics and Operation of the Oeneral Transmission and Distribution System.
 Coordination of Traction-circuit Stray Electric Fields and Foreign Circuits or Conductors.
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- XIII. Control of Current to the Traction Motors. XIV. Traction Motors.
- XV. Transmission of Power from the Motors to the Driving Wheels.
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- XVII. Economics and Operation of Motive Power.
- XVIII. Organization and Personnel for Electric Operation.

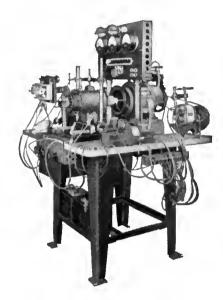
Special emphasis is given to such topics as power supply contracts, overhead distribution systems and economic data.

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Are you up-to-date? Here's the last word in a complete test bench

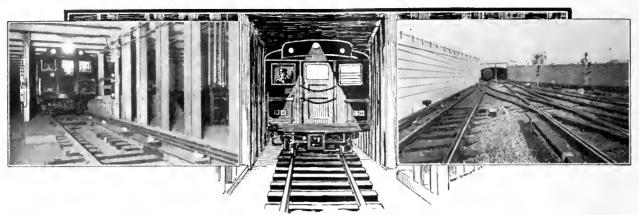


The new "Super" Test Bench for the very heaviest and most exacting work. Will take care of every electrical test job on any kind of small or large automobile, bus, truck, marine or airplane.

National Railway Appliance Co.

420 Lexington Ave., New York

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"Union" Signals Speed Traffic on P.R.T.

PHILADELPHIA'S newest high "Union" Subway Type Signals, Model 14 Switch and Signal Company. This is a traffic on this system as on the others in four-track structure having six inter- Philadelphia. "Union's" half-century of lockings in its seven-mile length. Trains experience in the signaling field enables are operated on close headway at the it to meet your signaling needs and propeak hours.

speed transit system, the Broad Street Electro - pneumatic Interlocking Ma-Subway, has been signaled by the Union chines, and auxiliary apparatus speed vide added economies.

Our specialists are at your service without obligation.

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R 11 Double Register

A Fare Registration System that Gains the Confidence of ALL

The durability, accuracy, speed and convenience of International Registers has given them the nation-wide reputation for efficient service that they have enjoyed for over thirty years.

Electric operation gives the new types even greater speed, accuracy and convenience. Mechanical hand or foot operation can be furnished, if required.

The International Register Co. 15 South Throop St., Chicago

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Brake shoes in street railway service get a lot of wear. They must stop smoothly and positively. this exacting work "Diamond S" brake shoes keep in service months after ordinary shoes have been scrapped.

The American Brake Shoe and Foundry Company

> 230 Park Ave., New York 332 So. Mich. Ave., Chicago



Gain Assembly

Economical Accessories for Tubular Iron Poles

Whether for new construction or for salvaging corroded poles, you will find these M.I.F. Specialities for tubular iron poles most economical, most sturdy and most easily installed.

Reinforcing and Extension Clamps

A Type—for reinforcing corroded joint between pipes differing in diameter by full inch. Or for extending pole with section

one inch smaller.

B Type — for reinforcing corroded swaged joint where pipe diameters differ by less than one inch.

C Type-for reinforcing pole corroded at ground-line. Or to extend pole with pipe of same size, as illustrated.

Ornamental Covers-designed to fit over similar Clamps, harmonizing with design of ornamental pole.

Williams Pole Mounts-used to anchor poles on bridges, rock, or concrete. Or

with pre-cast concrete base to salvage pole corroded at groundline. Or for maximum clearance with full length of pole

Crossarm Gains See illustration. Do not require drilling

of pole. For heavier loads bracing accessories are provided.

Cable Insulator Hangers and Span Wire Hangers—
provided in various types for suspending signal wires, etc., from messenger or span wires.

Send for literature with prices

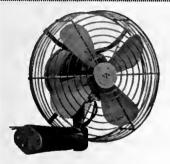
Malleable Iron Fittings Company

Pole Hardware Department
Factory and New England Salea Office: Branford, Connecticut
New York Sales Office:
Thirty Church Street





General Sales Agenta elsewhere in U. S.:
LINE MATERIAL COMPANY, South Milwankee, Wis.
Canadian Distributor: Canadian Line Materials, Limited, Toronto



Cool Comfort

Cool comfort is assured your passengers all summer long when your coaches are equipped with N-L Coach Fans.

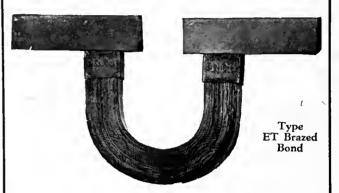
It effectively meets the long felt need of a reliable fan, built especially for heavy bus service.

An N-L Fan recently ran 2448 hours without stopping, requiring only a brush adjustment at that time. It was again placed in service and is still running. This is, we believe, a record for motors of this type.

Write for Supplement B-2.

The Nichols-Lintern Co. 7960 Lorain Ave., Cleveland, Ohio

Brazed Bonds Meet Every Requirement-



Conductivity

The conductivity of the braze-bonded joint is unsurpassed. The brazed union of bond terminal to rail is eight times the cross section of the bond, the ratio of conductivity of copper to steel.

Permanence

Brazed bonds stay on the job. A force of five to nine tons per square inch is required to remove a single terminal. We guarantee that when properly applied the terminals of brazed bonds cannot be removed from the rail except by actual mutilation.

Low Cost

The first cost of brazed bonds is low. Speedy application—15 to 20 bonds per hour-means low cost bond-Permanence of the bonded joint means exceptionally low maintenance.

A brazed bond to suit your rail is described in circular 12. Address—

The Electric Railway Improvement Co.

2070 East 61st Place, Cleveland, Ohio

CHOSEN for PERFORMANCE

ROLLEY wheels are never chosen for looks, never selected because one kind costs a little more or less than another. They're chosen for performance. That's why

KALAMAZOO



trolley wheels and harps are the standard of comparison today. That's why many properties use them exclusively. There's a difference in trolley wheels. May we tell you about it?

THE STAR
BRASS WORKS
KALAMAZOO, MICHIGAN





Drip Points for Added Efficiency

They prevent creeping moisture and quickly drain the petticoat in wet weather, keeping the inner area dry.

The Above Insulator—No. 72—Voltages—Test—Dry 64.000 Wet 31,400, Line 10,000.

Our engineers are always ready to help you on your glass insulator problem. Write for catalog.

Hemingray Glass Company Muncie, Ind. Eat. 1848—Inc. 1870

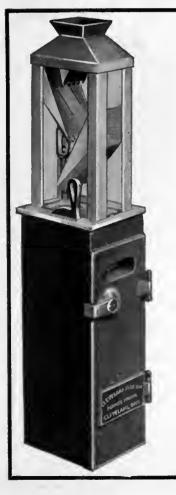
Modern Light weight Cars

With their fast operation, comfortable interiors, and attractive design are bound to appeal to the riding public. They have proven their ability to increase revenue and decrease operating costs on every property we have served. They will pay you, too.

CUMMINGS CAR AND COACH CO.

Successors to McGuire-Cummings Mfg. Co.

111 W. Monroe St. Chicago, Ill.



FLEXIBILITY

The "CLEVELAND" is the Fare Box that always fits the fare and fare collection system.

The "Cleveland" accommodates any rate of cash fare and either paper or metal tickets. It fits into any fare collection plan whether it be Flat Fare, the Zone System, or Service at Cost. Changes in your rate of fare never entail additional fare box expenditures if you adopt the "Cleveland."

Cleveland Fare Boxes meet all modern fare collection conditions.

The Cleveland Fare Box Co.

4900 Lexington Ave.

Cleveland, Ohio

Canadian Cleveland Fare Box Co., Limited, Preston, Ontario

"4-Way" Padlocks, Coin-Auditing Machines, Change Carriers, Tokens

"Facts," they say, "are stranger than fiction"

Perhaps, that's why a few railway operators who have been reading our advertisements for years have yet to give Boyerized Car Parts a trial.

They think that the statements we make are fiction. All we can say to these fellows is: "Ask the man who uses Boyerized Parts." He'll give you facts about long service life and freedom from maintenance troubles that will far outdo our own enthusiasm.

Two to three times the wear is what we say to be on the safe side!

BOYERIZED PARTS



Brake Pins Brake Hangers Brake Levers Pedestal Gibs Brake Fulcrums Center Bearings Side Bearings Spring Post
Bushings
Brake Bushings
Bronze Bearings
Bolster and
Transom
Chafing
Plates

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BEMIS CAR TRUCK COMPANY

ELECTRIC RAILWAY SUPPLIES SPRINGFIELD, MASS.

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F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 519 Delta Building, Los Angeles, Cal.

Roebling

Welding Wire

Makes strong welds and is used where only the highest quality of welding wire is acceptable.

John A. Roebling's Sons Company Trenton, New Jersey



PANTASOTE

TRADE MARK

—the car curtain and upholstery material that pays back its cost by many added years of service. Since 1897 there has been no substitute for Pantasote.

AGASOTE

TRADE MARK

—the only panel board made in one piece. It is homogeneous and waterproof. Will not separate, warp or blister.

> Standard for electric railway cars and motor buses



Samples and full information gladly furnished.



The PANTASOTE COMPANY, Inc. 250 Park Avenue NEW YORK

Less than a cent a gallon!

FOR less than one cent a gallon you can make up an Oakite solution that will prove the best thing you ever tried for washing the rattan seats, sashes, woodwork, handholds and windows of cars and busses. Oakite cleans speedily and thoroughly, and is safe for all car cleaning.

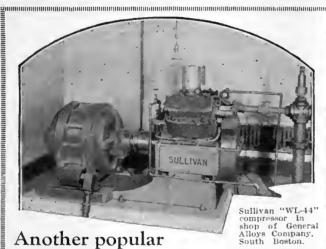
Many traction companies also use Oakite cleaning materials and methods in their maintenance departments. The Oakite Service Man near you can give you complete details—send for him. No obligation.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U.S. and Canada

Manufactured only by OAKITE PRODUCTS, INC., 28B Thames St., NEW YORK, N. Y.

OAKITE

Industrial Cleaning Materials and Methods



Sullivan Shop Compressor

direct connected—automatic—compact

Compactness, automatic control, direct motor or oil engine drive, and semi-portability, are some of the advantages of these Sullivan Vertical Compressors. The "WL-44" is a "Balanced V" 4-cylinder machine, available in capacities of 240 and 350 cu. ft. of air per min. "WL-22" has two vertical

cylinders, and capacities of 120 and 175 cu. ft.

Wafer valves, sweep-control unloading, automatic lubrication, and full water cooling of cylinder barrels and heads, are features which improve the economy of these machines. Compressor and engine are rigidly mounted on a cast iron base.

Send for Catalog 32/83-H

Sullivan Machinery Company 809 Wrigley Bldg., Chicago



6 years later we receive another letter from Mr. Hull

THERE is practically no limit to the years of service OHMER Fare Registers will give. Many of the first installations, made more than twenty-five years ago, are still protecting cash fare profits . . . eliminating clerical detail . . . giving accurate, dependable service. So the experience of the Conestoga Traction Company of Lancaster, Pa., is not unusual.

In 1922, Mr. Hull wrote to tell us that the OHMER Registers installed the previous year were doing all we had claimed. Six years later, in 1928, we received another letter from Mr. Hull. He writes, "Notwithstanding the fact that our suburban fare collections are rather complicated, we are pleased to advise you that your system of fare collection has been very satisfactory to both the Company and the trainmen."

Many Models for Many Needs

Let us help you determine the type of OHMER Register adaptable to *your* business. Let us show you how to reduce losses from carelessness, indifference and temptation . . . how to save time, money and labor. At your request, one of our transportation systems men will discuss with you your particular problems and study a solution to them. Write today.

OHMER FARE REGISTER CO., Dayton, Ohio



Let our SPECIALIZATION be of profit to you



"ARMATURE" BABBITT METAL

"ARMATURE" Babbitt Metal-Trolley Wheels and "TIGER" Bronze Axle and "ARMATURE" Bearings have been perfected by this organization because we have specialized in their development. Years of experimentation gave us a complete knowledge of proper quality and design—huge plants operated under chemical and physical laboratory control have made it possible to standardize and maintain the highest quality products. The personnel of this organization is composed of many men of proven ability whose connections with the electric railway industry date back to the beginning of electric railway transportation.

We will gladly cooperate with you.



"TIGER"
BRONZE
AXLE AND
ARMATURE
BEARINGS



National Bearing Metals Corporation ST. LOUIS, MO.

JERSEY CITY, N. J. PORTSMOUTH, VA.

PITTSBURGH, PA. MEADVILLE, PA.

NEW YORK, N. Y.

Some One Wants To Buy

the equipment or machinery that you are not using. This may be occupying valuable space, collecting dust, rust and hard knocks in your shops and yards.

Sell it

before depreciation scraps it.

The Searchlight Section is helping others—

Let it help you also

0057



NO MORE SIDE SWIPES!

THIS new and brilliant right-turn signal flashes the warning, STOP—CAR—TURNS, at points where cars turn across the automobile roadway, when they diverge from the main line, say to the right. It indicates only for those cars that make the turn. Cars that do not switch to the right drift under the current-selective contactor and go ahead without causing any signal display. Autos are warned when the car is about to turn.

NACHOD SPELLS SAFETY

Nachod devices include signals for single and double track, permissive and absolute, stub-end signals, highway crossing signals, headway recorders, overhead trolley contactors, relays, etc.

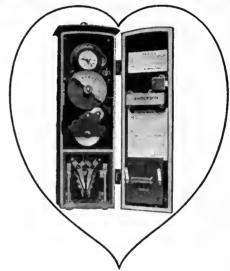
Nachod & United States Signal Co., Inc.

4777 Louisville Ave., Louisville, Ky.

August Issue Closes JULY 15th

Early receipt of copy and plates will enable us to serve you best to furnish proofs in ample time so changes or corrections may be made if desired.

ELECTRIC RAILWAY JOURNAL



The Heart of a Time Switch

The heart of a Time Switch is its clock; the better the workmanship and the sturdier the construction, the more dependable is the Time Switch.

The entire clock, including the switch, is made in our own factory—a clock designed and built specifically for use in our Time Switches.

That is one reason for their unquestioned reliability.

Send for Bulletin No. 37

Albert & J. M. Anderson Mfg. Co. 289-305 A St., Boston, Mass.

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with

Cross Grain
Chill of
Rim and Flange



SERVICE records maintained by one of the largest street railway companies show 38% lower cost per wheel mile for Griffin Chilled Tread Wheel than any other make or type.

Have you given the new wheel a trial?

GRIFFIN WHEEL COMPANY 410 N. Michigan Ave., Chicago, Ill.

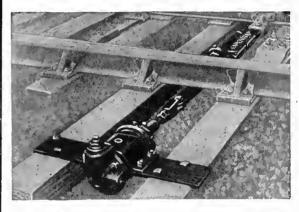
Used and Surplus Equipment

INDIVIDUAL items of used equipment, or surplus new equipment, or complete plants, are disposed of (and found) through advertising in the Searchlight Section of this paper.

This is the section which so effectively aided the Government in selling the many millions of dollars worth of surplus material and equipment accumulated during the war without disturbing the market.

"SEARCHLIGHT"





QUICK TO OPEN - SLOW TO CLOSE The Racor Oil Cylinder Retarding Dash Pot

acts on the principle of a door check. Used where switches are normally trailed through, it eases the return of the points and thus saves wear on the inside of the points. The action is definite and it will work under all climatic conditions. Particularly adapted for use with Ramapo Automatic Return Switch Stands.

RAMAPO AJAX CORPORATION

General Offices - 230 PARK AVENUE, NEW YORK

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METROPOLITAN SANK SLDG, W

CANADIAN RANAPO IRON WORRS, 270. Nagara Folia, Ontario

BUILDERS EXCHANGE BLDG, ST. PAUL line Racor Works Hillburn, New York, Niegara Palle, N.Y. Chicago, Illinole, Bast St. Louis, 1

OYMENT and BUSINESS and SURPLUS NEW

UNDISPLAYED-RATE PER WORD:

Positions Wanted, 5 cents a word, minimum \$1.00 an insertion, payable in advance.

Positions Vacant and all other classifications, excepting Equipment, 10 cents a word, minimum charge \$2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco officea count 10 words additional in undisplayed ada. Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proDISPLAYED-RATE PER INCH:

Other spaces and contract rates on request. An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

POSITION VACANT

WANTED master mechanic, Western short line interurban A.C. operation; state complete experience and salary expected, Address P-175, Electric Railway Journal, 883 Mission St., San Francisco, Calif.

POSITIONS WANTED

ELECTRICAL engineer desires position; 2 years as mechanic in car shop; 2 years as car and material inspector; 1 year as student electrical engineer; 1 year as assistant electrical engineer with the government. PW-180, Electric Railway Journal, 520 No. Michigan Ave., Chicago, Ill.

PURCHASING agent—Twenty years' experience as purchasing agent and storekeeper for three different large electric railways including gas and power properties and operating buses. Also accounting experience. Best references. Any location. Available immediately. PW-181, Electric Railway Journal, Tenth Ave, at 36th Street, New York.

STREET RAILWAY MAN, 32; eleven years' experience on railway checking and inside operating; six years on present position as condection with railway company as assistant or in some official capacity, familiar with all phases of the operating trainman. PW-182, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

BUSINESS OPPORTUNITY

MANAGER, experienced street railway, also bus operation, will handle small property on percentage basis. Or will buy good property. BO-179, Electric Railway Journal, Tenth Ave. at 36th Street, New York.

OFFICIAL PROPOSAL

Bids: August 2.

Furnishing and Installing **Systems**

New York, N. Y.

New York, N. Y.

Sealed bids or proposals for furnishing and installing the Block Signaling and Interlocking Systems for a portion of the Independent Systems for a portion of the Independent System of City Subways, in the Borough of Manhattan, City of New York, will be received by the Board of Transportation, acting for and on behalf of the City of New York, at the office of said Board at No. 49 Lafayette Street, Borough of Manhattan, New York City, until the 2nd day of August, 1929, at eleventhirty (11:30) o'clock a.m., at which time and place or at a later date to he fixed by said Board, the proposals will be publicly opened and read. A description of the work and other requirements, provisions, details and specifications are given in the Information for Contractors and in the Form of Contract, Specifications, Contract Drawings, Bond and Contractor's Proposal, which are to be deemed a part of this Invitation and copies of which may be inspected and purchased at said office of the Board.

The receipt of bids will be subject to the requirements specified in said Information for Contractors.

New York, May 21, 1929.

BOARD OF TRANSPORTATION OF THE CITY OF NEW YORK,

By JOHN H. DELANEY, Chairman.

DANIEL L. RYAN.

FRANK X. SULLIVAN,

Commissioners.

FRANCIS J. SINNOTT, Secretary.

WANTED

ELECTRIC RAILWAYS AND EQUIPMENT

Electric Railways, Overhead Trackage and Equipment. Highest cash prices paid. Expert satisfactory work guaranteed.

Among the other work just completed we have recently dismantled the entire trackless trolley line of Staten Island, New York and over 200 miles of overhead and some trackage of the Worcester Consolidated and Springfield Street Railway abandoned Suburban lines.

THE ALLITE CORPORATION

636-638 Broadway, New York, N. Y.

WANTED

5 BIRNEY CARS

Double end, must be in good condition and price must be low. Address

UNION TRACTION COMPANY Coffeyville, Kansas

WANTED

1—Second-hand Rolary Converter. Must
be in good condition, price reasonable and
to the following specifications:
8 Poles, 1,000 kw. capacity, 900 r.p.m.,
650 voit, 1,540 amp., 6 phase, 60 cycles,
compound field winding.

W. Wineiow, Boston Revere Beach & Lynn Railroad 350 Atlantic Ave., Boston, Mass.

QUIPMENT of the latest type is frequently advertised for resale in the Searchlight Section.

Don't let a limited budget stop you from buying modern cars. busses or equipment that will cut costs or improve your service. Modernize your lines throughout now by buying wisely from these equipment bargains.

Stretch your Budget to Cut Your Costs

THE PERRY, BUXTON, DOANE CO.

New and Relaying Rails

All Weights and Sections

We specialize in buying and dismantling entire Railroads, Street Railways, and all other industrial properties which have ceased operation. We furnish expert appraisals of all such properties.

May We Serve You?

THE PERRY, BUXTON, DOANE CO.

Rail Department, Philadelphia, Pa. General Department, Boston, Mass.

Pacific Sales Office-Failing Building, Portland, Oregon

you don't see the equipment you need advertised on these pages, send a list of your requirements to the Searchlight Department, Electric Railway Journal, 10th Ave. at 36th St., N.Y.C. You will be put in prompt touch with reliable sources of supply.

FOR SALE

30 Freight and Passenger Cars

All in first-class condition. Also storeroom materials and car and shop repair parts. Dismantling road. Priced to sell quick. Address

W. G. Bell, Gen. Mgr. Springfield Suburban R. R. Co. Springfield. Ohio

FOR SALE

500 KW., 1,000 KW., 1,500 KW., 25 cycle

Rotary Converters

Send for List of Motor Offerings

Write or Wire to

G. T. ABEL

393 Seventh Ave., New York City

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"Sole Distributors for
SIMPLEX SAFETY DEVICES"

Girder Rails

141 lb. Section 465, 9-in. high. 106 lb. " 422, 9-in. high.

High "T" Rails

93 lb. Section 507. 7-in. high 28 to 32-ft. lengths. Immediate Shipment—All New

7ELNICKER IN ST. LOUIS

Have you any Rails or Equipment for Sale?

Saving is a good habit, BUT— Why Save Things You'll Never Use?

HY let Mother Nature grow grass between the wheels of replaced cars? Why pile up rails, shop equipment, power plant equipment, line equipment, car appliances, road building material, etc., etc., you will never use again?

TODAY you can turn them over at a fair price. Tomorrow they will be—JUNK. Is it not the better part of good horse-sense to dispose of them NOW?

6000 other electric railway men will see your advertisements of used or surplus equipment and materials here—in the Searchlight Section of their business paper.

Some of these men—officials or executives of other lines in other parts of the country and operating under different conditions—can use what you no longer need. For an insignificant investment you

can tell these others what you have. And they will buy.

One "Searchlight" advertiser wrote, "We can cheerfully recommend the Searchlight Section as a wonderful medium for reaching buyers of rails and equipment." Another—"The strongest proof that your 'Searchlight' finds its way to many readers is shown by the numerous letters we have received in answer to our recent ad."

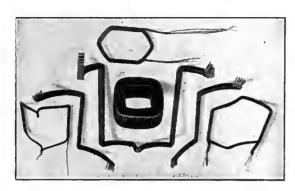
Let us tell you the cost of advertising your used or surplus equipment and materials in the Searchlight Section. Just address a list of what you have to dispose of to the

Searchlight Department

ELECTRIC RAILWAY JOURNAL

Tenth Ave. at 36th St., New York, N. Y.

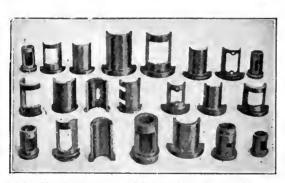
COLUMBIA QUALITY



Only the best grade of double cotton covered magnet wire, molded or pressed to accurate slot dimensions, is used in the making of Columbia Armature and Field Coils.



This Equalizer Bar and Brake Rigging are good examples of Columbia Heavy Forgings. Our complete equipment enables us to provide a wide variety of light and heavy forgings. Send us your blue prints and specifications.



Columbia No. 1—an especially developed bearing bronze—gives Columbia Armature, Axle and Journal Bearings the long wearing qualities that have made them standard equipment on many of the leading roads.

COLUMBIA MACHINE WORKS & M. I. CO.

265 Chestnut Street, Corner of Atlantic Avenue BROOKLYN, NEW YORK

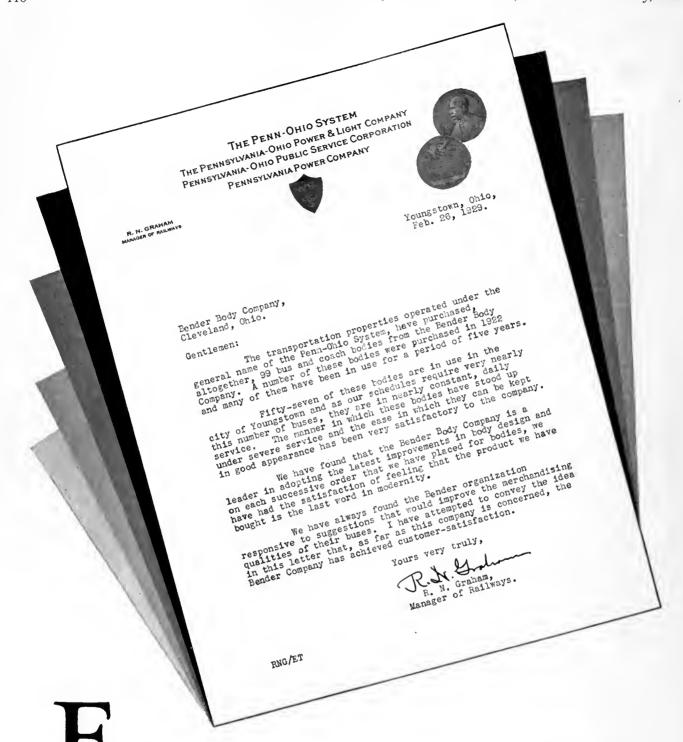
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Searchlight Section—	Classified Advertising
EQUIPMENT (Used, Etc.). 100-107 EMPLOYMENT	Perry, Buxton, Donne Co107 Springfield Suburban Railroad Co





OR the past seven years we have been supplying buses to the Penn-Ohio System, noted for its able management and progressive policies.

It is a source of gratification to realize that Bender Bodies have possibly contributed in some degree to this company's successful record.

THE BENDER BODY CO.

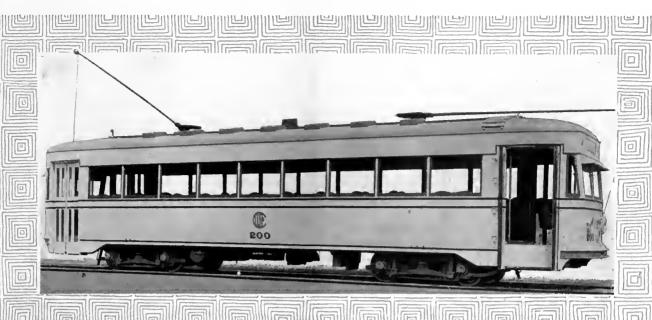
W. 62nd and Denison, Cleveland, Ohio











Lima Cars Exemplify Brill Craftsmanship

Two double-end cars were recently built for service in Lima, Peru. These cars embody the MASTER UNIT design but were constructed with nine windows on each side instead of eight which is standard for double-truck MASTER UNIT cars. They are excellent examples of coordinated engineering skill and Brill craftsmanship in electric car construction.

Such up-to-date equipment indicates that our South American neighbors know the value of modern cars in attracting fares and lowering operating costs. Weight, fully equipped, is 34,640 pounds. Total seating capacity is 48. Peruvian citizens will have the opportunity of riding in comfort on these cars, which will operate in Lima as well as between that city and Callao, the seaport.

Details may be obtained for the asking.



THE J. G. BRILL COMPANY



AMERICAN CAR CO

G.C. KUHLMAN CAR CO.

WASON MANTO CO

Pacific Coast Representative: R.a.to Bldg., San Francisco

Brill MASTER UNIT Caus

Strengthen the links between motor shaft and wheels



Grade M gears meshed with grade A-1 pinions—here is a combination to relieve your gearing worries.

Hard but not brittle, this G-E long-life gearing minimizes breakage and reduces maintenance and replacement costs.

CMO

Good operating practice requires that gearing be properly enclosed and well lubricated. G-E gear cases are rigid and strong; they hold the gear grease, exclude dirt, and permit easy adjustment to compensate for any wear of supporting brackets.

CMO

Every maintenance man realizes the value of quality in bearing linings. G-E linings are made especially for haulage service and are typical of the engineering and manufacturing excellence back of every G-E renewal part.



GENERAL ELECTRIC

360-34

ELECTRIC RAILWAY JOURNAL

Graw-Hill Publishing Company, Inc.

AUGUST, 1929

Thirty-five Cents Per Copy

More Profit Per Car

In car journals and motor armatures, Timken Bearings are exerting their waste-preventing, maintenancereducing, endurance-promoting influence for increased profits.

Leading railroads have approved them, and are enjoying the advantages obtainable only through the exclusive combination of Timken tapered construction... Timken POSITIVELY ALIGNED ROLLS... and Timken steel.

T H E T I M K E N ROLLER BEARING COMPANY C A N T O N . O H I O

TIMETER Roller BEARINGS

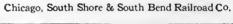
CHICAGO

on Business or Pleasure - -

Patronizes High-Speed Electrified Railroad Service - -

SAFE, frequent, speedy, comfortable and reliable passenger trains from Chicago to Milwaukee, Wis., on the "North Shore Line" and to South Bend, Indiana, on the "South Shore Line", travel the 87.19 miles and 89.8 miles respectively, in two hours flat including all stops. These schedule speeds are unequaled on this continent.

This excellent service is an important factor contributing to the growth of Chicago and nearby communities.





NAME OF RAILWAY RUN	Distance	Regular Schedule Stops	Time	M. P. H. including Stops
Chicago, South Shore & South Bend to South Bend Railroad Co. Chicago	89.8	6	2 hrs.	44.9
Chicago, North Shore & Chicago to Milwaukee R. R Milwaukee	87.19	13	2 hrs.	43 59



Chicago, North Shore & Milwaukee Railroad

The Chicago, North Shore and Milwaukee Railroad has recently purchased 25 additional cars equipped with Westinghouse motors and control of the same type

All main line passenger rolling stock on both railroads is equipped with Westinghouse Motors and Westinghouse HL Control.

which have established splendid records of performance in this supertransportation service.

-WESTINGHOUSE ELECTRIC & MFG. COMPANY EAST PITTSBURGH PENNSYLVANIA

SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES





Electric Railway Journal

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Editorials

Consolidation of Street Railway Journal and Electric Railway Review PAUL WOOTON
Washington
ALEX MCCALLUM
London, England

CHARLES GORDON, Editor

Vol. 73, No. 17

Pages 755-818

LOUIS F. STOLL Publishing Director

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AUGUST, 1929

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Short Signal Cycles Speed Up Traffic	Services Annual Convention Number Sept. 14 Advancing the industry's thought on its fundamental problems Four Convention Dailies Sept. 30, Oct. 1, 2 and 3 Your newspaper while at Atlantic City
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McGRAW-HILL PUBLISHING COMPANY, INC., TENTH AVENUE AT 36TH STREET, NEW YORK, N. Y. CABLE ADDRESS: "MACHINIST, N. Y."

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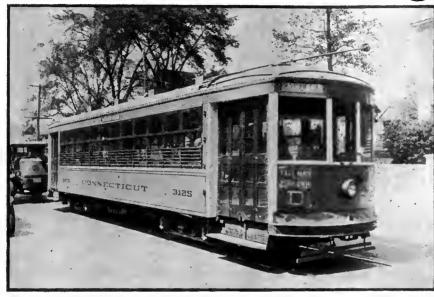
Member A.B.P.

Official correspondent in the United States for Union Internationale de Tramways, de Chemins de fer d'Intérét local et de Transports Publics Automobiles.

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Quieter Riding



One of the twentyfive Connecticut Company cars equipped with Westinghouse-Nuttall noiseless gears.

on Connecticut Cars

TWENTY-FIVE cars on the Connecticut Company system now offer quieter riding than heretofore, for these cars have been entirely equipped with Westinghouse-Nuttall noiseless helical gears.

Operation is quieter because helical gears inherently give a smooth, gradual load transfer from tooth to tooth. Long service does not impair this result, because helical

teeth always retain their correct involute form, and the BP "tough-hard" heat-treatment gives these gears exceptional resistance to wear and breakage.



In addition to these characteristics, Westinghouse-Nuttall noiseless gears have a silencing device* which entirely eliminates, without the aid of the gear lubricant, the high pitched ring common to all metallic gears.

These are the reasons why Westinghouse-Nuttall noiseless helical gears are helping progressive operators like the Connecticut Com-

pany, to increase riding comfort.

The nearest Westinghouse office can give you complete details.

*This same device can be applied with equal effectiveness to Westinghouse-Nuttall spur gears.



WESTINGHOUSE ELECTRIC & MFG. COMPANY NUTTALL WORKS PITTSBURGH, PENNSYLVANIA SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES







HIGH brush mileage is dependent, among other things, on the fit of the brush in the box.

With the continuous movement of the brush, the box is bound to wear.

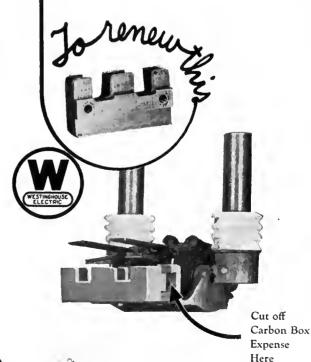
To hold correct carbon box dimensions at a nominal cost, the Westinghouse detachable box brushholder has been designed.

This construction permits the use of a hard bronze metal in the carbon box without greatly increasing the cost and makes it possible to detach and renew the carbon box when worn.

Why scrap the whole brushholder to renew the carbon box!

Westinghouse Electric & Manufacturing Company
East Pittsburgh Pennsylvania
Sales Offices in All Principal Cities of
the United States and Foreign Countries

Westinghouse





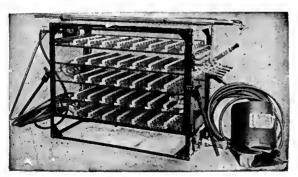
Improved Atlas Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

Crowded off the streets?

Will street cars be crowded off the streets by the ever mounting number of automobiles?

Not where street car transportation meets the demand for swift, safe, silent, comfortable transportation.

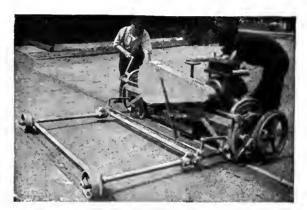
Only such service will satisfy the public nowadays.

Only on well maintained track can such street car service be supplied.

Only by constant rail grinding and welding can track be well maintained economically.

Here is the equipment.





Vnlcan Rail Grinder



Midget Rail Grinder

Railway Track-work Co.

3132-48 East Thompson Street, Philadelphia

Chester F. Gailor, 50 Church St., New York
Chas, N. Wood Co., Boston
Electrical Engineering & Mfg. Co., Pittsburgh
H. F. McDermott, 208 S. LaSalle St., Chicago
P. W. Wood Railway Supply Co., New Orleans, La.
Equipment & Engineering Co., London
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RTW Curve O rea

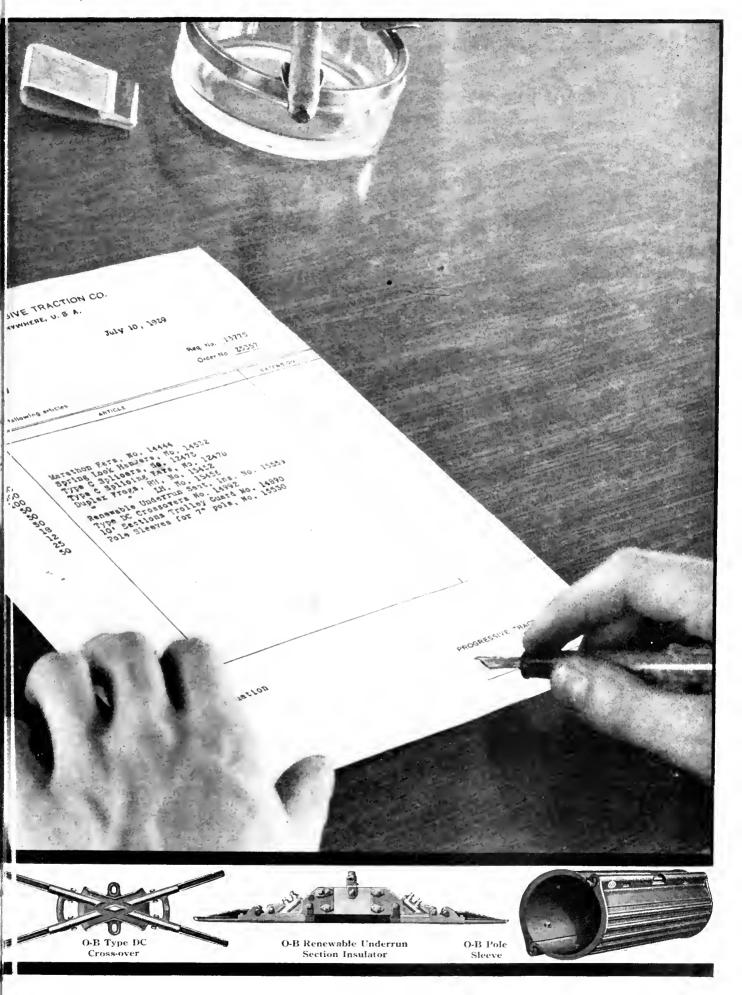
O-B Duplex Frog



O-B Spring Lock

Hanger

O-B Type C Splicer



Proved by Years of Service

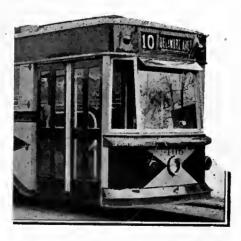




Hunter-Keystone Signs

Hunter-Keystone Illuminated Signs "tell the public where you're going" night and day. They consist of specially printed roller curtains which are turned or regulated by a small crank handle so that any one of the ten or more destination names may appear. They are mounted in sheet steel cases or they may be built into the car structure.

Let us send you complete information about Hunter-Keystone Illuminated Signs and about other Keystone Equipment found in the modern well-equipped car.





Faraday Signal Systems are made for every requirement-high or low voltage systems, buzzers, vibrating bells or single stroke bells, resistance panels, flush or surface type push buttons.

They are not only a passenger convenience but a real help to car operators because they signal stops definitely.

Faraday Signal Systems make a definite bid because of their RELIABILITY and long service. You can't go wrong in installing them.



No. 22181 Resistance Panel

ELECTRIC SERVICE SUPPLIES (

Home offics and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; Olsirict offices are located at 111 North Cand Street, Chicago, Ill. and 50 Church Street, Vaw York City.

MANUFACTURER OF RAILWAY, PO

Branches—Bessemer Bldg., Pittsburgh; 88 Broad Street, Boston; General Motors Bldg., Detroit; 316 N. Washington Ave., Scranton. Canadian Agents—Lyman Tubs & Supply Com-pany, Ltd., Montreal, Toronto, Vancouver.



WHO SAYS the public won't ride the trolleys?

Constant improvements in equipment to meet the changing needs of traffic maintain the position of the street railway as the safest, most convenient and most popular form of urban transportation. Treadle-ization is one of the most important of such improvements.

NATIONAL PNEUMATIC COMPANY

Executive Office: Graybar Building, New York

General Works: Rahway, New Jersey

CHICAGO 518 McCormick Building MANUFACTURED IN TORONTO, CANADA, BY Railway & Power Engineering Corp., Ltd.

PHILADELPHIA
1010 Colonial Trust Building





The H. & K. No. 900D Double Chair has brought street railway seating to the highest point of modern luxury and comfort. It is, however, but one of the many Hale & Kilburn styles developed to fulfill this function in all fields of transportation.

When a chair at home is too near the heat or too far from the light, it can easily be *moved* into proper relation. But the seats, lights, windows and heaters on a trolley car are in a *fixed immovable position*.

Once uncomfortable upon a car—always uncomfortable. It is necessary, therefore, to bring these factors into right relation at the start and a Hale and Kilburn seating engineer, working with you from the beginning of the design of the car, will assure the maximum degree of final comfort.

We have half a century's experience to aid, not only in providing the most practical *arrangement* of these comforts, but in providing the most practical and comfortable type of *seat* for every type of city and inter-city service.

HALE & KILBURN SEATS

"A Better Seat for Every Type of Modern Transportation Service"

HALE & KILBURN COMPANY

General Offices and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES

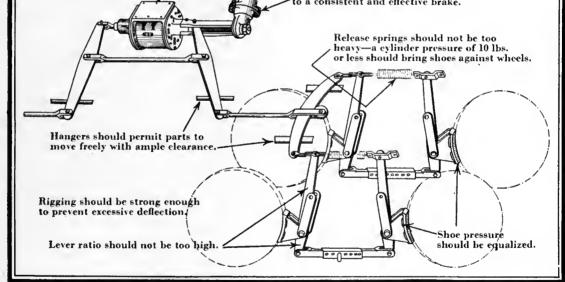
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Brake rigging of correct design and construction—which permits transfer of cylinder effort to brake shoes with minimum loss and without delay—is another means of shortening stops.

Automatic Slack Adjuster contributes to a consistent and effective brake.

Release springs should not be too heavy—a cylinder pressure of 10 lbs



The common brake rigging faults of heavy release springs, weak construction, excessive friction or interference, high lever ratio, and lack of equalization, cause sluggish, ineffective, and uncertain brake operation.

It will pay you to investigate the condition of brake rigging on your ears. Our engineers are available for consultation and assistance.

WESTINGHOUSE TRACTION BRAKE CO. General Office and Works, Wilmerding, Pa.

WESTINGHOUSE TRACTION BRAKES



"Road delays due to tire trouble cut in half"



48 motor coaches of the East St. Louis Railway Company and affiliated companies, East St. Louis, Illinois, are on Goodyear Tires

As tangible evidence of the extra values derived from the use of Goodyear Tires and Goodyear service, the following statement stands out in a letter from an official of the East St. Louis Railway Company:

"It is my understanding that road delays due to tire trouble have been cut in half on account of operating with one make of tire, with repairs under the supervision of Goodyear repairmen, as compared with what we were doing when we had many makes of tires on our buses and took care of our own repairs."

The "one tire" named was Goodyear. During the year ending Oct. 31, 1928, the 48 buses with Goodyear tires made 1,751,326 miles—a distance great enough to make this experience significant to any fleet operator.

Naturally, the transportation of passengers calls for maintained schedules. Freedom from roadside delays is an asset in good-will, worth considering in the choice of tires.

In part, as pointed out, it may be traced to the expert attention of Goodyear Truck and Bus Tire Service Station Dealers. But wide experience also shows that the extra vitality, the extra resistance to fatigue secured in Goodyear Tires by the use of Supertwist, contributes materially to the long life and dependable performance which these tires deliver.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service





-reconditions car trucks



RAILWAY operators find in arc welding a means of reconditioning and reclaiming worn and broken parts at a fraction of the cost of replacement. Type "F" welding electrode is especially suited for this work because it can be applied in awkward positions with uniformly good results. For example, many damaged parts of car trucks are now welded at the drop-pit without dismantling the car.

Practically every part of a railway truck can be welded satisfactorily with Type "F"—side-bearing plates, side-truck frames, brake-shoe heads, bolt or pin holes in the brake rigging, and cup joints, to mention only a few. All the "slid-flat" or flaked-out places on the rolled-steel wheels, as well as on the sharp-flanged wheels, can be similarly reconditioned at low cost and with little loss of time.

Learn more of G-E welding electrodes from the G-E Welding Electrode Distributor near you or Section E-508, Merchandise Department, General Electric Company, Bridgeport, Connecticut.



In simplicity, reliability, and ease of operation G-E arcwelding sets are unequalled. They are available in all sizes, all types—for either hand or automatic operation—for one or more operators.



550-511

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

Will these

Are you changing any routes?



If conditions are such as to require major changes on any of your street-car routes, it will pay you to investigate the advantages of trolley buses. The only additional right-of-way work would be placing the second trolley wire, which can be strung at a small cost since the overhead is already up.

Under most conditions, the trolley bus has the lowest operating cost of any railless vehicle. Its advantages also include unlimited power, fast acceleration (with PCM control), quietness, speed on grades, and flexibility.

The 15 trolley buses recently purchased by the Utah Light and Traction Company for Salt Lake City are equipped with G-E motors and type PCM control.

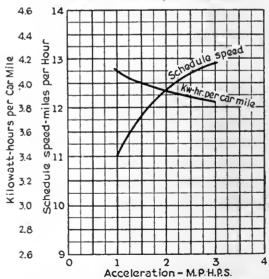
Suggestions

A faster acceleration that saves power

Cars equipped with PCM control accelerate faster than those equipped with any other control—yet they use less power under identical operating conditions. The reason for this apparent inconsistency is shown by the following curves.

As the acceleration is increased, the free-running speed of the car is reached more rapidly, resulting in increased

7 Stops per mile. Duration of stops, 8 seconds. 550 volts. 2.5-m.p.h.p.s. braking. Weight of car equipped, less load, 36,000 lb. Passenger load, 4,000 lb. Four 50-hp., 600-volt motors. 69/14 gearing. 26-in. wheels. Maximum theoretical schedule. No coasting. No leeway.



Schedule speed—energy curves for various rates of acceleration in city service

GENERAL ELECTRIC COMPANY

RASCHENECTADY,

Solve Your Problem?

schedule speed. This increase in schedule speed and in operation at free-running speed decreases the kilowatthours per car-mile as shown.

If your problem is one of fast, smooth acceleration, it will pay you to use PCM control.



The foot-operated master controller of the PCM-equipped car leaves the operator's hands free



The PCM control contactors are automatic. The cylinder rotates in one direction for series connections and in the opposite direction for parallel. There is no movement of the cylinder between full parallel and the first series point

A new bulletin is ready for you



General Electric has recently published a new bulletin, "Line Material". In this publication are hundreds of representative G-E line-material devices with their applications and uses.

If your problem is one of overhead construction and maintenance, you will find many helpful suggestions in the new bulletin. A copy is yours on request. Ask the G-E office nearest you for GEA-1067.



JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

ELLES C TRRICES

SALES OFFICES IN PRINCIPAL CITIES

- For "the hardest operating conditions in the United States" -



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COMPANY, OFFICES

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

CHARLES GORDON, Editor

Volume 73

New York, August, 1929

Number 17

Reviving the Will to Win

WHEN the will to win permeates an organization from top to bottom, victory is already half won. This truth has been recognized by military leaders from the time of Alexander the Great on down to the days of Pershing and Foch. Examples are not lacking to show that this axiom applies with equal force in the affairs of

every day life.

A few years ago the spectacular achievements of electrical engineering were attracting much attention and many opportunities for improvement in the design of steam locomotives were being overlooked. Because of the wonderful progress of electricity, the morale of the mechanical engineers was relatively low. They were disheartened but they were not beaten. With grim determination they pushed the design of superheaters, automatic stokers, boosters and other devices that greatly increased the efficiency of the steam locomotive. steam and electricity are competing on a new basis. Continued progress will be made in electrification, but the day has apparently not arrived when the steam locomotive will be generally superseded by electricity on our trunk line railroads. Had not the steam locomotive designer challenged the advent of electricity with improvements previously undreamed of, the iron horse of the poets would today be definitely on the way out. It is greatly to the credit of these designers that the challenge of competition found them just starting to fight.

A close parallel to this can be found in the local transportation industry. Widespread public attention has been attracted by the spectacular development of the bus, while the street car has come to be regarded as a back number. Although bus service has actually replaced car service on only a very small part of the track mileage of the country, the contrast in appearance between old run-down cars and new up-to-date buses has created the impression that the day of the electric railway is passing. The attitude of the public has been contagious and many electric railway men themselves became discouraged—to say nothing of the builders of cars. Apparently sight was lost of the fact that attractive modern vehicles, comfortable, speedy and quiet can be built to run upon rails

as well as upon rubber tires.

Of course, this is easier said than done. Difficulties are real and numerous in the way of improving the performance of street cars to the extent to which they must be improved if they are to survive. But these difficulties are not insurmountable. Evidence of a reviving confidence in the future of the electric railway is quite apparent. So also is the evidence that the field for the motor bus is far broader than that anticipated for it during its early days, and that replacement of unprofitable rail mileage is a secondary rather than a primary field for the automotive vehicle. When the problems facing the industry are attacked in a spirit of confidence, apparent

difficulties may be expected to give way before courage and determination. Here again, the will to win is half the battle.

Legislation Needed to Check Cut-Rate Taxicabs

THOUGH taxicabs offer a type of tame, service closely approximating that of a private automobile, the extensive promotion of flat and cut-rate taxicab operations in the past two years has lowered the standard of this industry, much to the regret of the legitimate cab companies, which are striving to maintain this vehicle in its proper place. Wherever cut-rate taxis have started up, price wars have followed, resulting in some instances in an increased volume of taxi riding but with losses to all established transportation agencies giving local service. The experiences have proved that semiprivate vehicles cannot be operated permanently at rates of fare comparable to those charged by mass transportation vehicles, and that the whole set-up is economically unsound. But in spite of the many failures under cut rates and the agitation against this kind of operation these operators have continued to expand until at the present time they exist in approximately sixteen large cities and 122 smaller cities throughout the country.

Legitimate taxicab companies have been the principal sufferers from this evil, but the electric railways also have been affected, in some cases rather seriously. In line with their objective of carrying a large number of riders at a small fare the cut-rate cabs have really turned "jitney." paralleling the street car lines and picking up their passengers. The cab rates in some cities actually are lower, when four people ride, than are those of the street car. Naturally the cut-rate cabs collect much revenue that properly belongs to the railways.

It is the opinion of H. A. Innes-Brown, editor of Taxi Weekly, who spoke on this subject at the recent C.E.R.A. meeting and whose paper is abstracted elsewhere in this issue, that the only solution to the problem is to secure protective legislation. Moreover, to be really protective this legislation should be sought by the street car companies as well as the legitimate taxicab companies. Local council ordinances ruled out the jitneys in most cities but only after the jitneys had seriously harmed the railways. Similar legislation, as suggested by Mr. Brown, is just as necessary at the present time to check this second jitney peril.

It is always unfortunate when transportation agencies leave their own proper field in search of business that really does not belong to them. The net result usually is a lowering of their standard of service and a reduction in revenue for the other agencies with no increase in their own net income. Cities in which cut-rate cab companies are now operating will suffer from impaired service

from both the legitimate taxical companies and the electric railways in the long run if they do not take steps to end this disastrous attempt to sell transportation for less than it costs.

Complete Analysis Proves Value of Equipment Replacement

PERHAPS the most complete record ever compiled of the results obtainable through the replacement of obsolete, heavy rolling stock by light equipment of more modern design, is published elsewhere in this issue in an article by F. W. Bacon, vice-president International Utilities Company. The results are of particular interest and significance because they represent a complete historical record giving a comparison of income and expense for old and new equipment on a combined interurban and city system, on which a complete replacement of all existing rolling stock was made.

Nor are these the only considerations that commend these tabulations to the earnest attention of the entire industry. Second only in importance to the completeness of the record, is the fact that this whole analysis deals with exactly the type of property that has been the subject of the most serious question in discussions regarding the future of electric railway operations. The city lines of the Kentucky Traction & Terminal Company are located in a community which even in the "booster" figures of the Chamber of Commerce is credited with a population of only 60,000. The interurban lines are of the type which radiate from this comparatively small city, into surrounding rural territory.

Moreover, the economies usually available in a change from two-man to one-man operation do not enter into the results on this small city property, for the change to one-man operation had been made a number of years before new equipment was purchased, and all figures, both for the five-year period with old equipment and for the five years with the new cars, are based upon one-man operation. Finally, it is worthy of special note that the old cars which were replaced were not the heavy double-truck units so commonly in use, but were single-truck cars weighing only 26,350 lb. In the light of these significant facts, therefore, Mr. Bacon's article seems to justify careful study by every operating executive who is giving attention to the possibility of equipment improvements.

Earning Power as a Basis of Security

SIGHT should not be lost of the nice financial point made in the decision rendered recently by Supreme Court Justice Rodenbach, in which he authorized the New York State Railways to abandon the Rochester and Sodus Bay line and parts of lines in Syracuse, Utica and Sherrill. The question involved was the substitution of property under the terms of a mortgage given to secure an issue of bonds. For the bondholders, the Security Trust Company of Rochester questioned the right of the railway to discontinue the lines. It wanted to be sure that the letter of the mortgage under which it acted in behalf of the bondholders would be met under the changes proposed.

The mortgage agreement did not directly mention abandonment of any part of the system, but Justice Rodenbach pointed out that there could be no question that discontinuance of useless and unprofitable lines was to be expected. In his opinion, the use of the property

would be clogged to an unnecessary extent by forcing maintenance of the lines it was intended to abandon. In this particular case he felt the bondholders were safeguarded since the public authorities had recognized the changed conditions and had readjusted fares to meet the change.

Even more important than that was the opinion of the court to the effect that holders of bonds secured by mortgage on physical property were required to co-operate in the readjustment to the new conditions. This was not intended as a rebuke to the trustee. It was the kind of an expression of opinion the trustees desired, restricted as they had been under the terms of the indenture securing the bonds. Of course, there will be salvage from the sale of the abandoned railway lines. From this source officials of the New York State Railways hope to realize \$70,000, and they have signified their willingness to turn this amount over to the trustees, together with stock in seven allied bus lines which the railway will control.

As pointed out briefly in Electric Railway Journal, News for June 22, this case serves to emphasize again the fact that it is not so much the actual property back of their bonds to which the bondholders may look, but rather to the earning capacity of that property. It was an interesting issue upon which the court passed—interesting from both the practical and the academic points of view.

Developing Men as Well as Machinery

MEN and machinery! These two things tersely sum up the whole of the transportation industry and of its problems as well. What thought and effort have been devoted to the machinery! What fortunes have been spent on research and improvement, more research and more improvement! Today street cars run almost unbelievable distances without a failure, dwarfing the records of the much-advertised endurance fliers and commercial automobiles. Substations run automatically, almost without the touch of a human hand. Track has been improved time after time and become better and better, as the result of the expenditure of millions of dollars in research.

But human research has lagged. Employees have offered themselves, or the personnel department has gone outside the gates and hired them, never expecting to find the perfect man to match the perfect machine. In a measure this is right, for of course the perfect man does not exist. But after the man is hired, even if he is the best we can get, he is also as good as he can be made?

In isolated spots careful selection of employees along the well-established principles of psychology has brought a better grade of men, better suited to take up transportation work. Nearly all companies have realized the necessity of a brief period of training to adjust the raw material to the new and unfamiliar tasks. But almost always the training has stopped at this point and has failed to carry on educational and developmental work to broaden the employee, intensify his interest in his job, and fit him into the scheme of the industry so rationally that he knows he is part and parcel of it. Many have followed the maxim: "To educate a nigger is to spoil a good mule driver," and that to initiate a motorman or conductor into the problems of the company he works for is to unsettle him, make him dissatisfied and make him feel too good for his job.

Not all men react alike to education and training.

But with proper selection at the time of hiring, no fear need be entertained as to the effect of future instruction and education. The employees need to know the business because they are the salesmen of the service. So far as 99 per cent of the customers are concerned, these men are the only representatives that they ever know or even see. Like it or not, they discuss the affairs of the company together. Why not have them well informed, accurately informed, painstakingly informed, so that they may present our business to our customers as we would do it ourselves were we to meet them?

After all, the success of this industry is particularly dependent on the performance of its men. One side supplies the capital or the management, or perhaps both; the other makes the direct contact with the public. One side supplies the machinery and the vision; the other gives the man power without which they would be useless. Men and machinery. Machinery and men. And the one must be developed as well as the other.

Drivers of Hard Bargains May Suffer Most

IT SEEMS incredible that ideas should persist in the matter of franchise grants that have been unsound for more than a quarter of a century. But such ideas do persist among the representatives of the public chosen to office. This is particularly true in cities of moderate size, in several of which grants are now under negotiation. It is not so much the radical who would drive a hard bargain, but rather the small business man, the very man who ought to know better.

Instead of looking at the situation as a business proposition, deciding the amount and character of service best designed to meet the requirements of the community and then making terms that will enable the company to give that service, the process too often is reversed. There is little in the proceedings of the modern business concept that both parties should gain from a contract. The principle that there is a mutuality of interest between the negotiators in a franchise hearing, rather than the idea of barter and trade, needs constant reiteration. There is no such thing as a low franchise bid. The trials and tribulations of the past with railway receiverships prove that no organization can continue indefinitely to render service at a loss. Service tends unmistakably to seek the level of the liberality or lack of liberality of the franchise itself.

Change Needed in Concept of Utility Regulation

RECENT developments in the power industry have focused public attention to an unusual extent upon the subject of utility regulation. Much of the discussion which has been heard sounds like an echo from the dark ages, when the object of regulation was restrictive and punitive, rather than constructive. Many of the self-appointed guardians of the public welfare seem to feel that because private interests are making attractive profit the public is being gouged. Henry Ford, in a recent interview in the *Electrical World*, disputes that assumption. He insists upon the modern conception of business fair dealing, that the reward for initiative and enterprise is a secondary consideration, provided that both parties profit from the transaction.

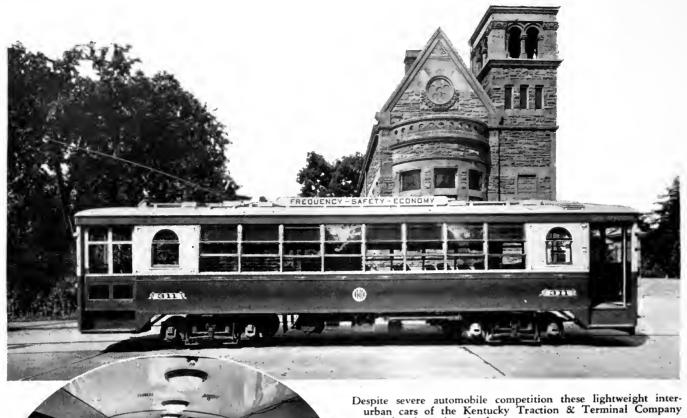
With the local transportation industry, the problem is different but not less important. Power is a vital and necessary service, but so also is transportation. Although the public has much at stake, its attention is more difficult to attract because the problem is one of relieving the industry in difficulty in contrast with that of controlling one which is expanding rapidly. Nevertheless it is apparent that the public is the greatest sufferer through the inability of community transportation facilities—under the conditions imposed—to keep pace with growing community requirements.

Proceedings before regulatory commissions with respect to local transportation are limited largely to the age-old ground of valuation, and the right to earn a fair return. But in many instances the primary question is not one of right to earn but of ability to earn. Local transportation encounters today a new factor which demands a radical change in the whole concept of regulation. That is competition. And it is obvious that any business is hopelessly handicapped in meeting competition unless it is permitted that necessary flexibility with respect to rates which is essential in meeting the inroads of unregulated competitors. In any such vital facility as community transportation, the public interest lies in regularity, reliability, safety and character of service. The public interest also demands that the facilities available be permitted to keep pace with growing community requirements. Without a sound financial basis, no enterprise can accomplish these objectives. It seems high time, therefore, that while the public is considering the deficiencies of present regulatory policy, the need for a changed concept to permit greater flexibility in the management of local transportation be given the attention which its importance warrants.

More Speed for the Locals

REATURED in advertising, manned by selected employees, and favored by the dispatcher, the interurban limiteds are the pride of the road. So that they can get through in the fastest possible time, work trains, freight trains, and passenger locals must give way and take to the sidings. The cars used on the limited runs often have been specially designed for this purpose. They are provided with easy riding trucks, powerful motors, wide windows, upholstered seats and other refinements directed toward passenger comfort and convenience. All of which is as it should be and in line with present-day tendencies. This kind of service has done much to uphold the prestige of the interurbans and to offset the inroads of automobile and bus competition.

But would it not be well also to give attention to the matter of speeding up the local trains and bringing these cars up to the standard that is provided for the limiteds? Those who ride the locals constitute a numerous element of the patronage at all seasons of the year. As a class they are people of influence in their respective communities whose good will it is desirable to cultivate. Most assuredly they would react favorably to improved service either in the way of greater comfort or greater speed. While it may not be possible to provide parlor cars, it will nearly always be possible to speed up a local schedule. By speeding a little here and cutting a siding there; by taking advantage of every possible opportunity to gain a moment's time—in the main by clearcut instructions to the motormen to "hit the ball," and by tightening up the schedule accordingly, the trains can be sent over the road in faster time, and the passengers impressed by the fact that they are receiving the faster service for which there is so general a demand.



paid for themselves in three years

Complete Car

New cars on 70-mile interurban i

Passenger comfort combined with attractive simplicity feature the interior of the lightweight one-man operated interurban

URING a continuous period of eighteen years, the Kentucky Traction & Terminal Company, which I represent, has owned and controlled the public utility properties comprising power and light, local transportation and ice, serving exclusively the city of Lexington, Ky., and surrounding territory. Consequently, we have had a very major interest in the development of the city and its immediately tributary territory. The transportation property comprises some 70 miles of interurban system (divided into four lines radiating out from Lexington) and 17 miles of city trackage. Prior to 1922 there was in operation on the interurban a standard type of car weighing approximately 35 to 40 tons, of the design in common use at that time, and operated with two men. In the city the cars were a common type of single-truck equipment. They weighed $13\frac{1}{2}$ tons and had been operated with one man for a number of years before they were replaced.

On a property of this size, facing the rapid growth in automobile competition, it was obvious that the possibilities for the development of transportation business were limited. The maximum length of ride on the city lines New cars on 70-mile interurban in rural territory return investment in three years and in five years on 17-mile city property in community of 60,000. Detailed summary of operating results over ten-year period presents unusually complete analysis of new car economics

By

F. W. BACON

Vice-President International Utilities Company

is not more than 1 mile, and under these conditions the effect of direct automobile competition and, in addition, their tendency to pick up passengers waiting for street cars, is particularly severe. Nevertheless, this company was faced with its responsibility for maintaining efficient, modern, comfortable and attractive transportation service in the community whose good will it has continued to enjoy for many years and with whose destiny its other utility properties, as well as its transportation system, are intimately associated. Here, then, was a problem of keeping faith with the community and at the same time keeping operating costs and fixed charges on the transportation

lines within the limits of the volume of business that could be expected.

We were convinced that frequent and convenient headway is essential in any transportation service which may be expected to win a fair response from the public. We recognized, likewise, that with the old equipment available, it was impossible to provide the character of transportation service which we felt the public had a right to expect; or to hold operating costs at a point which would permit the property to continue to maintain reliable transportation service in the community. Consequently, we decided to replace all of the existing equipment on the entire property-both interurban and city lines. The replacement was made on the interurban in 1922. The cars selected were of a light-weight doubletruck type to be operated by one man. Twelve of these were purchased, and all of the old equipment was either sold or scrapped. In the following year the cars on the city lines were all replaced with 27

Common "Y"

Although the maximum length of ride in Lexington 15 only 1 mile, new lightweight cars have produced a substantial increase in patronage and revenue and have returned their cost in five years despite jitney and bus competition. Buses of the Kentucky Coach Company now carry more than 1,800,000 passengers per year. The buses parallel two important rail lines

Replacement

in Lexington

Returns Investment

light - weight, singletruck one-man cars of a special design, in which careful attention was given to features of passenger comfort and in Five Years

attractiveness. The total investment was \$306,999. Since this property now furnishes a rather complete example of an entire replacement of equipment on both an interurban system and a small city operation, for which results are available over a sufficient period of time to afford a fair basis for drawing conclusions, it

should be of interest to the industry to set up a comparison of operating results over a period of years before and after the acquisition of the new equipment, so far as it is possible to set up such a comparison and to attach significance to the figures. Obviously, the question of

greatest interest is whether or not the investment in new equipment was justified. We are quite convinced that it was. In fact, if we

had attempted to continue operation of the interurban lines with the old equipment, this part of the property would have long since been abandoned. Had that been made necessary, the million passengers now handled annually by these lines would have been forced to use other forms of transportation at a probable increased cost of transportation service. We feel that had this become necessary it would have been against the general interests of Lexington and its surrounding territory, in which, as the operators of power and ice utilities, we have a considerable stake. On the

TABLE I- COMPARATIVE CHECK ON ALL FOUR INTERURBAN LINES OF AUTOMOBILE AND BUS OPERATION DAILY AVERAGE

Daily average of automobiles, huses and passengers as shown by check of five (5) days, same hours, same men making the check and at the same points each year 1912 to 1928.

year 1712 to 172	Auto- mobiles	Per Cent Increase	Pas- sengers	Per Cent Inc. or Dec.	Average Passengers per Automobile	Licenses Issued Lexing- ton
August, 1912 August, 1921 June, 1924 May, 1925 May, 1926 September, 1926 September, 1927 September, 1928	2,321 2,817 3,841 3,847 4,519 5,464	697.5 21.3 36.3 0.1 17.4 20.9	935 5,614 6,125 8,698 7,960 10,476 12,596 12,477	500.4 9.1 42.0 8.4 31.6 20.2	3.21 2.41 2.17 2.26 2.07 2.31 2.30 2.20	4,717 9,485 10,577 11,534

Buses and Bi	US PAS	SENGERS DA	ILY AVERAG	GE, ALL DIV	VISIONS
	Buses	Per Cent Inc. or Dec.	Passengers	Per Cent Inc. or Dec.	
May, 1925		5416	432	1414	Per Bus
May, 1926 September, 1926 September, 1927	. 80	27.8 2.5 1.2	621 610 658	43.7 1.7 7.8	9.7 7.6 8.3
September, 1928		1.2	655	1.4	8.3

city lines the results have been such that we feel that the service has been put upon a basis on which it can be perpetuated for the community, despite the limited earning power of a street railway system in a city of approximately 60,000 population.

CAR INVESTMENT LIQUIDATED ON BOTH INTERURBAN AND CITY LINES

On the most conservative basis of comparison with the old cars, the investment in the interurban equipment was liquidated within three years. This has been accomplished despite an average annual reduction in gross revenue of approximately 5 per cent. On the city lines the new car investment was liquidated within approximately a five-year period. I want to make it quite clear that the transportation property of this company as a whole is not a money-making enterprise even in its present form. It is with considerable difficulty that we are able to make the property self-sustaining, due to its limited scope of operations. When you look at our earning statement today, including intercompany charges and depreciation, etc., a casual observation would lead to the conclusion that it is a decided liability. This, however, is not the case; efficient and economical transportation service is a necessity to this community, vital to its development and welfare, and although the railway does not contribute directly to the earning power of the combined operations after paying its interest and its proportion of the general overhead we regard the transportation system as a real asset to the combined properties. While the investment in new cars has not contributed any collectible return, it has, through putting the property on a self-sustaining basis and through its general effect upon the public's attitude, contributed in a very real way to the interests of the company.

Taking up now the specific analysis of the effect of the new equipment on the interurban lines, the immediate effect of comfortable light-weight cars and improved service increased the gross revenue during the first year following the replacement. A competing bus service, however (since acquired by this company), and steady, increased use of private motor vehicles, has had the effect of causing a decrease in gross averaging about 5 per cent a year. Therefore, it is of particular interest to note that on the interurban lines the liquidation of the investment in new cars over a period of three years has been accomplished entirely through operating economies, and the investment has proved to have been justified despite a gradual loss in gross business.

To give a fair idea of the extent of the competition

TABLE II—INTERURBAN DIVISION INCOME STATEMENT THREE YEARS NEW CAR OPERATION VERSUS THREE YEARS OLD CAR OPERATION

	Total Three Years Actual New Car Operation July 1, 1922, to June 30, 1925			Total Three Years Actual Old Car Operation July 1, 1919, to June 30, 1922			New Ope	e or Decr ration O Operatio	ver	Assuming Old Equipment Had Been Continued in Service 1922-1925 at Former Cost per Car-Mile			
Passenger revenue	Amount	Per Cent of Gross Earn- ings	Per Car- Mile in Cents 0.350	Amount \$978.087.79	Per Cent of Gross Eern- ings 100.0	Per Car- Mile in Cents 0.507	Amount \$70,199.41	Per Cent	Per Car- Mile in Cents 0.157	Amount \$907,888.38	Cost per Car- Mile 0,350	Increase or Decrease Over New Car Operation	Per Cent
Operating expenses: Ways and structures Equipment Power Conducting transporation. Traffic General and miscellaneous	. 174,334.58 . 43,372.09 . 128,704.60 . 188,670.03 . 9,197.37	4.8 14.2 20.7 1.0	.067 .017 .050 .072 .003	159,689, 33 55,236, 35 160,581, 64 176,048, 61 4,735, 72 90,843, 30	16.4 5.6 16.4 18.0 .5 9.3	.083 .029 .083 .091 .002	14,645.25 11,864.26 31,877.04 12,621.42 4,461.65 13,946.70	9.2 21.5 19.8 7.2 94.2 15.4	.016 .012 .033 .019 .001	215,305.40 75,227.19 215,305.40 236,057.73 5,188.08 *76,896.60	.083 .029 .083 .091 .002	\$40,970.82 31,855.10 86,600.80 47,387.70 4,009.29	19.7 42.3 40.2 20.1 77.2
Total operating expense Net operating revenue Taxes—local	. 286,713.11	31.6	. 239 . 111 . 024	\$647,134.95 330,952.84 54,175.89	66, 2 33, 8 5, 5	. 335 . 172 . 028	\$25,959.68 44,239.73 7,575.11	4.0 13.4 14.0	.096 .061 .004	\$823,980.40 83,907.98 54,175.89	.318 .032 .021	\$202,805.13 202,805.13 7,575.11	241.7
Gross income Interest charges on never equipment at 7½ per cen	A'		.087	\$276,776.95	28.3	. 144	\$51,814.84 28,734.63		.057	\$29,732.09	.011	\$195,230.02 28,734.63	
Gross income after interes charges on new equipmen		3 21.6	. 076	\$276,776.95	28.3	.144	\$80,549.47	29.1	.068	\$29,732.09	.011	\$166,495.39	559.9
*Car-miles basis not u Cost of cars Passengers, car-miles Revenue passengers carrie Revenue per passenger i	. \$127,709.52 . 2,594,041 d 3,696,772			1,929,377 3,657,852			664,664 38,920	34. 4 1, 1					
centa Number of track-milea Average yearly saving Average yearly return Average yearly return	s account of ne on investment on investment	before i	nterest c terest ch:	harges								\$55,498.46 50.99 43.5%	6
Twelve new interurba Change from two to c	n cars were inst ne man operati	ailed du on of ca	ring the	period from Fo	eb. 8, 192 eb. 11 an	z, to Ma d 24, 19	iren 5, 1922. 22.						

Change from two to one man operation of cars was made between Feb. 11 and 24, 1922.

Weight of old interurban cars 75,600 lb.

Weight of new interurban cars 25,100 lb.

Fares: Effective June 10, 1918, cash rate increased from 2½ cents to 3 cents per mile, and mileage rate increased from 2 cents to 3 cents per mile.

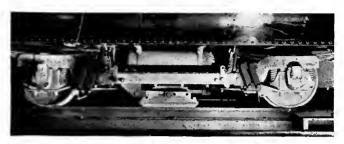
Effective Aug. 21, 1920, cash and mileage rates increased from 3 cents per mile.

Effective Dec. 1, 1921, cash rates were reduced from 3% cents to 3½ cents per mile, and tickets rates reduced from 3% cents to 3 cents per mile.

There is an additional saving of \$30,000.00 yearly in the operation of the new interurban cars due to the reduction in the power house kilowatt demand being released for commercial purposes

encountered, there is presented herewith in Table I the results of periodic checks of highway traffic made since 1912. Each check was made for a period of five consecutive days from 6 a.m. to 6 p.m., and shows the number of motor vehicles and the passenger movement per day on roads between points served by our interurban lines. The checks were made at the same points each year, during the same hours and by the same men. It will be noted that in 1927 and 1928 there was an average of approximately 12,500 passengers carried daily by automobiles between points served by the four interurban lines. The average number of passengers per car varied between 2.2 and 2.3. Although there was a slight increase in the number of automobiles between 1927 and 1928, there was a slight decrease in the number of passengers riding in them. There has likewise been a slight decrease in bus passengers, and there are indications that for the time being, at least, the conditions have become static.

Table II presents a detailed summary of operating statements on the interurban before and after the substitution of new equipment. There is also presented in this table, for comparison, a summary of what the statement would have been during the period for the new equipment, had the old equipment been continued in operation. It is assumed for purposes of comparison that the same service had been given with old equipment as was given with the new, and that the gross revenue would have been the same as it has been for the new equipment. Obviously, an analysis of the financial results with new equipment on this basis, in an effort to determine the justification for the investment in new cars, is indeed very conservative. There is every reason to believe that



The unique air-magnetic track brake developed on this property has made possible increased speed with safety and has effected large reductions in accident cost. The illustration shows the equipment mounted on the single truck of the city cars

the gross revenue would not have been the same had the old cars been continued in service. In fact, we are quite convinced that it would have been much lower, and that with the higher attendant operating costs, these interurban lines would have long since been abandoned. Table II shows a comparison of the three-year period immediately preceding the installation of new cars, with the three years immediately following. These figures do not show the economy resulting from the light-weight equipment in the form of reduced power station demand. which released generating capacity for the sale of commercial power amounting to \$30,000 per annum.

GROSS INCREASED ON CITY LINES

In Table III there is presented a comparison of operating statements for the city lines over a five-year period with old and new equipment. Prior to the installation of new cars it had been found impossible to increase the

TABLE III—LEXINGTON C	HTY DIVISION	INCOME	STATEMENT	FIVE	YEARS	NEW	CAR	OPERATION	VERSUS I	FIVE Y	EARS OF	LD
			CAR OPE	CRATIC	ON							

				C	AR OF	MALIO	LN .							
	Total Five Years Actual New Car Operation Jan. 1, 1924, to Dec. 31, 1928			Car Operation		1918,	Increase New Ope Old O		ver	Continued	Assuming Old Equipment Had Been Continued in Service 1924-1928 at Former Cost per Car-Mile			
Passenger revenue	Amount \$1,434,341.24	Per Cent of Gross Earn- ings 100.0	Per Car- Mile in Cents 0, 276	Amount \$1,218,056,41	Per Cent of Gross Earn- ings	Per Car- Mile in Cents 0.304	Amount \$216,284,83	Per Cent 17.8	Per Car- Mile in Cents	Amount \$1,434,341,24	Cost per Car- Mile 0, 276	Increase or Decrease Over New Car Operation	Per Cent	
Operating expenses: Ways and structures Equipment	146,200.46 81,416.89	10.2	.028	181,166.91 73,846.43	14.9	.045	34,966.45 7,570.46	19.3 10.3	.017	233,949.92 93,579.96	.045	\$87,749.46 12,163.07	37.5 13.0	
Power	80,684.65 375,614.82 20,152.40 118,865.81	26.2	.016 .072 .004 .022	103,515,52 336,514,58 9,530,71 129,039,16	27.6	. 026 . 085 . 002 . 033	22,830.87 39,100.24 10,621.69 10,173.35	22.1 11.6 111.4 7.9	.010 .013 .002	135,171.06 441,905.40 10,397.77 *118,865.81	. 026 . 085 . 002 . 022	54,486.41 66,290.58 9,754.63	40.3 15.0 93.8	
Total operating expenses	\$822,935.03	57.4	. 158	\$833,613,31	68.4	. 209	\$10,678.28	1.3	.051	\$1,033,869.92	. 198	\$210,934.89	20.4	
Net operating revenue Taxes—local	\$611,406.21 96,029.35		.118	\$384,443.10 87,417.11	31.6 7.2	. 095 . 022	\$226,963.11 8,612.24	59.0 9.8	.004	\$400,471.32 87,417.11	.078	\$210,934.89 8,612.24	52.7 9.8	
Gross income			. 100	\$297,025.99	24, 4		\$218,350.87 67,232.85	73.5 100.0	. 027	\$313,054.21		\$202,322.65 67,232.85	64.6 100.00	
Gross income after interest charges on new equipment			.087	\$297,025.99	24.4	. 073	\$151,118.02		.013	\$313,054,21	.061	\$135,089.80		
*Car-mile basis not use	d.													
Cost of cars				3,996,731 19,276,730			1,202,156 2,041,510	30.1 10.6						
Cents Number of track-miles Average yearly savings	6.7 16.02 account of nev	v equip	ment	6.3 16.02				6.3				. 27,017.9		
Average yearly return	on investment	betore i	nterest ch	harges	• • • • • • •						• • • • • • •	. 22.69 15.19		

Lexington Board of Commerce Population Statistics 1923—50,000 1926—56,801 1924—48,641 1927—57,312 1925—55,000 1928—59,808

Twenty-seven new city cars installed during the period June 24, 1923, to Sept. 2, 1923.

Weight of old city cars, 26,350 lb.

Weight of new city cars, 16,000 lb.

Fares: Effective Nov. 18, 1917, cash fare increased from 5 cents to 6 cents; Metal tokens from 4½ cents to 5½ cents.

Effective June 14, 1920, cash fare increased from 6 cents to 7 cents; Metal tokens from 5½ cents to 6½ cents.

Effective Dec. 21, 1927, cash fare increased from 7 cents to 8 cents; Metal tokens from 6½ cents to 7½ cents.

There was no reduction in station demand account of installation of the new city light weight cars, due to air and magnetic brakes, increased speed and other trically operated safety devices.

All operations, both with old and new equipment were one man.

revenue; in fact, the property was steadily losing ground in the face of growing automobile competition. It should be noted particularly that there has been an increase of 30.1 per cent in passenger car-miles operated for the five-year period with new equipment, compared to the preceding five years with the old cars. This brought an

increase of 17.8 per cent in gross revenue, and an increase of 10.6 per cent in the number of revenue passengers carried. All of this is based upon a ten-year comparison—five years with old equipment and five years with the new cars. Operating expenses decreased only 1.3 per cent. The costs per car-mile, however, were

TABLE IV—KEN	TUCKY COA	CH COM	MPANY INCO	ME STA	TEMENT FR	OM JUN	E 1, 1925, TO	DEC. 31	1928	
	Seven Months Dec. 31, 1925 Per		Twelve Mo Dec. 31, 1		Twelve Months Dec. 31, 1927 Per		Twelve Months Dec. 31, 1928 Per		Total Three Years and Seven Months Per	
Passenger revenue	Amount I \$19,157.03	Bus-Mile	Amount E \$93,415.42	Bus-Mile	Amount E \$123,824.43	Bus-Mile	Amount E \$139,155.90	Bus-Mile	Amount \$375,552,78	Bus-Mile
rassenger revenue	\$17,137.03	0.145	\$75,415.44		\$123,024.43		\$137,133.70		4373,332.70	0.107
Operating expenses: Maintenance of plant and equipment Operating garage expenses. Conducting transportation Traffic promotion. General and miscellaneous.	9,547.46 5,841.43 6,138.52 640.89 4,291.74	. 072 . 044 . 047 . 005 . 033	40,061.93 28,808.57 24,321.58 866.32 7,970.18	. 068 . 049 . 041 . 001 . 014	53,340.89 32,019.98 31,814.87 891.15 10,251.52	. 071 . 042 . 042 . 001 . 013	47,854.08 31,775.13 34,423.80 1,055.29 13,791.83	.063 .041 .045 .001	150,804.36 98,445.11 96,698.77 3,453.65 36,305.27	.044 .043 .002
Total operating expenses	\$26,460.04	. 201	\$102,028.58	. 173	\$128,318.41	. 169	\$128,900.13	. 168	\$385,707.16	. 172
Net operating revenue	\$7,303.01 1,157.53	.056	\$8,613.16 2,191.06	.014	\$4,493.98 5,426.11	.006	\$10,255.77 6,396.50	.013	\$10,154.38 15,171.20	
Gross income	\$8,460.54	.064	\$10,804.22	.018	\$9,920.09	.012	\$3,859.27	. 005	\$25,325.58	.012
Interest charges on investment at 7 per cent	1,053.36	.008	6,285.88	.011	9,555.64	. 013	11,593.96	. 015	28,488.84	.012
Gross income after interest charges	\$9,513.90	.072	\$17,090.10	. 029	\$19,475.73	. 025	87,734.69	.010	\$53,814.42	.024
Return on investment before interest charges, per cent	25,796.45 131,730 293,113 6.6		89,798.41 588,605 1,426,214 6.6		136,509.18 761,406 1,869,922 6.6		165,628.05 766,817 1,805,807 7.7		417,732.09 2,248,558 5,395,056 7.0) ,

Fare is the same as charged on street railway and transfers are accepted by the rail system.

Before the inception of the Kentucky Coach Company there were thirteen independent buses operating in the City of Lexington in competition with the city cars, and present bus operation parallels part of city car operations.

MANUAL MINISTRAL				Om 1 2222 Om	. mromto i T			
TABLE V-TRACK A	AND ROADW	ALL DIVI		OST AND ST.	ATISTICAL .	DATA		
1								
Year	1921	1922*	1923**	1924	1925	1926	1927	1928
Superintendence	\$5,264.92	\$4,918.67	\$6,377.90	\$7,136.80	\$5,851.56	\$6,792.62	\$7,004.38	\$6,935.06
Ballast	1,094.32	849.21	1,434.32	1,558.10	173.92	421.91	243.08	614.25
Tiea	25,619.88	24,264.11	8,288.90	16,443.65	12,861.64	9,061.69	13,029.33	11,135,52
Rails and rail fastenings.	2,279.28	2,617.19	3,148.60	691.54	819.91	985.30	1,425.35	271.76
Special work. Track and roadway labor.	2,250.24	5,853.64	443.61	3,556.34	1,056.54	947.84	2,667.19	859.42
Daving	27,066.89	25,005.85	27,857.16	26,528.41	23,742.38	19,286.88	24,968.34	20,346.39
Paving	5,703.11	4,851.01	10,286.72	10,093.71	9,457.13	2,483.93	3,163.59	3,464.35
anow, etc	6,620,52	8,159.82	6,305.63	7,605.46	6,943.34	6,471.02	4,754,72	3,658.09
Bridges, treatles, culverta, crossings, etc.	2,581.79	2,959.87	7,436.54	8,760.47	3,928.80	4,301.10	3,613.01	2,269.48
Diagos, treatica, cutverta, crossings, etc	2,301.77	2,737.07	7,430.34	0,700.47	3,720.00	4,301.10	3,013.01	2,207.40
Total	\$78,480.95	\$79,479.36	\$71,519.38	\$82,364.48	\$64,835.22	\$50,752.29	\$60,868.99	\$49,554.32
Per cent of gross revenue	11.9	14.3	11.9	13.6	11.1	8.5	10.3	8.6
Car-miles operated	1,619,090	1,750,197	1,922,051	1,930,137	2,025,674	2,214,062	2,251,170	2,228,612
Maintenance cost per car-mile operated.	\$0.049	\$0.045	\$0.037	\$0.042	\$0.032	\$0.023	\$0.027	\$0.023
Number of miles of track	93.79	91.33	83.69	89.35	89.35	89.33	89.33	89.33
Total cost per mile of track maintained	\$836.77	\$870.24	\$854.57	\$921.81	\$725.63	\$568,14	\$681.40	\$554.73
Total car and passenter ton-miles of tare	38,178,884	33,142,318	25,824,807	20,766,743	21,318,600	23,406,211	23,746,784	23,484,862
Number of ties used	28,466	20,562	6,973	13,261	9,893	6,663	10,022	8,593
Cost per tie	\$0.90	\$1.18	\$1.18	\$1.24	\$1.30	\$1.36	\$1.30	\$1.30
Cost of ties based on present market value of \$1.30	\$37,005.80	\$26,730.60	\$9,064.90	\$17,239.30	\$12,861.64	\$9,061.69	\$13,029.33	\$11,171.03
Miles of paved single track	18.70	18.70	18.70	18.70	18.70	18.70	18.70	18.70
*First year light-weight interurban equipment. **Fir	at year light-v	veight city equ	ipment.					

TABLE VI—SIX YEAR COMPARATIVE ACCIDENT STATEMENT COVERING COLLISION ACCIDENTS, PEDESTRIAN, VEHICLE AND STOCK

							•		
					*02/				Per Cent Increase
Interurban	1923 Straight Air	1924 Straight Air	1925 Straight Air	Average 1924-1925 Straight Air	1926 Seven Months Straight Five Months Air Magnetic	1927 Air Magnetic	1928 Air Magnetic	Average 1927-1928 Air Magnetic	Or Decrease Average Years 1924-1925 Compared With 1927-1928
Miles operated	846,950	853,242	945,181	899,211	1,061,929	1,090,183	994,018	1,042,100	15.8
Number of accidents. Amount of money spent for claims Average cost per accident. Miles per accident. Speed, miles per hour.	\$9,577.01 145.10 12.832	71 \$7,131.43 100.44 12,017 19.3	\$5,208.12 57.86 10,502 19.6	80 \$6,169.77 79.15 11,259 19.4	\$3,960.61 42.13 11,297 20.2	\$2,272.40 39.10 18,796 20.2	\$2,711.64 40.47 14,836 20.2	\$2,492.02 39.78 16,906 20.2	22.5 59.6 49.7 50.1 4.1
	Seven Months Hand Brake			Average 1924-1925	Eleven Months			Average	D C
Combined Cities	Five Months Straight Air	Straight Air	Straight Air	Straight Air	Straight Air One Month Air Magnetic	Air Magnetic	Air Magnetic	1927-1928 Air Magnetic	Per Cent Increase or Decrease
Miles operated Number of accidents	1,076,668	1,085,317 306	1,134,446	1,109,881	1,174,017	1,171,457	1,113,571	1,142,514	29.4
Amount of money apent for claims	\$3,468.88	\$3,424.10	262 \$7,293,84	284 \$5,358.97	291 \$4,049.63	264 \$963,74	\$1,727,80	\$1,332.27	13.0 75.1
Average cost per accident	9.50	11.18	27.83	19.50	13.91	3.54	7.48	5,51	71.7
Miles per accident	2,949 7.7	3,546 8, 2	4,330 8.0	3,938 8.1	4,034 8.6	4,3 91 8.8	4,825 9.0	4,608	17. 1 9. 8
Automobile registration		9,485	10,577	10,031	11,534	12,350	13,472	12,911	28.6
Actual money saved on collision acc Estimated number of application	s per annum bas	sed on check n	iade Septemb	er and Octol	oer. 1927 which	indicate an	without magn	etic brakes	OF OF
per day based on 30-car operati	10 11								14,604
Estimated number of accidents pr					rators for 10	178			107
Actual decrease in front-end accid	ienta in two year	rs' comparison							109
Estimated reduction total									431
The total maximum cost of any or	ne accident in th	e past five year	rs was \$1,250.						

reduced from an average of 20.9 cents for the old equipment, to 15.8 cents average over the five-year period with new cars, or a net reduction of 24.4 per cent. All operations in this comparison, both before and after the installation of new cars, were one-man. The net result of the investment in new cars has been (after deducting interest at the rate of $7\frac{1}{2}$ per cent on the new cars) to increase the gross income 50.9 per cent over the five-year period, while at the same time permitting service to be increased 30.1 per cent. The net annual return on the investment in new cars was 22.6 per cent. It seems quite obvious, therefore, that the investment in new equipment was amply justified.

But even the summary given in Table III does not tell the whole story of the showing made by the new equipment. During the five-year period of operation with new cars, severe jitney competition developed in Lexington. This was accompanied and followed by 5-cent, at random, ous competition, paralleling the rail lines in the city and running to points beyond. In 1925 this was cleaned up through the installation by our company of a modern bus system, which now operates approximately 766,000 miles per year and carries more than 1,800,000 passengers. Much of this operation is in the direct territory of the railway, while some of the routes reach into areas beyond the rail lines. The important fact, in considering the question of the results accomplished with new cars on the railway, is that although the bus system has built up new business of its own, a considerable portion of its traffic is directly competitive with the railway lines. A summary of the bus operations is presented in Table IV.

TRACK LIFE EXTENDED AND MAINTENANCE REDUCED

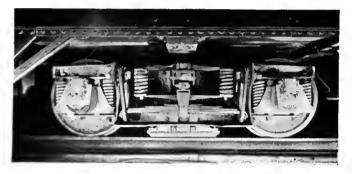
Still another phase of the experience on this property seems worthy of particular note. In all studies of the possible economies to be expected through the purchase of modern light-weight equipment, the factor of track life and track maintenance are major items upon which it is extremely difficult to make even approximate estimates. Our experience, therefore, extending as it does over a period of more than five years with a complete replacement of cars, helps to throw additional light on the possibilities for track economies through the operation of light-weight equipment. In our particular situation, covering all the depreciable values in the track and roadway department, we estimate that the substitution of lighter cars has extended the life of this structure 50 per cent. We value this property—rail fastening, special work, bridged ties and paving (all the actual depreciable property in the track and roadway department)—at \$1,083,000. Based on these values we estimate that the reduction in depreciation amounts to \$18,058 per year, which would be properly creditable to the return on the investment in new cars.

Table V gives a summary of the total track and road-way maintenance on this property for the past eight years, and also certain statistical facts with respect to the track department. The figures include all divisions, both interurban and city lines. They are set up to show the year 1921, the last year in which operation was entirely with old equipment. In 1922 the interurban cars were changed, and in 1923 new cars were operated on the city lines as well. For the remaining five years, 1924 to 1928 inclusive, all operations were with new equipment. The statement indicates a reduction of approximately \$20,000 per year in the total expenses of this department. Of this amount, our organization estimates that the direct economy which may properly be credited

to the light-weight equipment is slightly more than \$15,000 per year, or approximately 5 per cent on our total car investment of \$306,999.

TRACK SAVING ALONE JUSTIFIES INVESTMENT

Adding together the amount creditable because of increased life of track through decreased wear and tear with light-weight equipment, and the direct reduction in maintenance cost, the total saving is approximately \$33,000 per year, or 10.7 per cent on the cost of the new cars. On the basis of a permanent property, therefore, the investment in new cars is justified by the figures for track economies alone. The facts of outstanding interest in Table V are not only the reduction in total cost, but in the track cost per car-mile operated, which is about half the former figure. The ton-mile information given is approximate only, but on the basis shown represents about a 40 per cent decrease despite considerably increased car mileage. The costs for maintenance per mile of track during the latter periods shown in Table V —with increased age of the structure—in comparison



New trucks built by the Cincinnati Car Company, are designed so that the air-magnetic track brake is carried between the wheels

with earlier years, seem of particular interest and significance.

One feature of the equipment on both interurban and city cars on this property is of enough special interest to seem worthy of particular mention. This is the success achieved in the reduction of accidents and accident costs after more than two complete years of experience with a special auxiliary magnetic track brake which was applied to all of our new cars during the year 1926. The development of the equipment followed continuous and persistent though vain efforts to reduce the number of accidents and the accident liability on the property. We finally came to the conclusion that there was need for some more positive means of stopping cars in an emergency than that afforded by the conventional air brake. After considerable study, and in collaboration with the engineers of the Cincinnati Car Company and the General Electric Company, there was perfected a special type of air-magnetic track brake which gives the motorman of a car marginal braking capacity, in the event of emergency, 30 per cent to 35 per cent above that of his air brakes alone, regardless of rail conditions.

Full details of this equipment were given in an article in the July 17, 1926, number of ELECTRIC RAILWAY JOURNAL. Our pupose in this development was primarily that of reducing accidents—fulfilling to the limit of our ability a moral obligation to the public and to our passengers. In addition to this humanitarian objective was the desire to reduce the cost and losses which invariably result from accidents regardless of where the actual

TABLE VII—COST OF INSTALLATION, MAINTENANCE, OPERATION AND DEPRECIATION AIR-MAGNETIC BRAKES

Installed 53 equipments May 17,1926, completed Dec. 26, 1926

\$26,602.43 3,724.34 2,128.20
376.42
\$6,228.96
15,408.91 6,228.96
\$9,179.95
48.5

responsibility lies. After two years of experience with all cars equipped with this device, there is presented in Table VI a five-year record of accident statistics and costs for the property.

Table VI shows large reductions in the number of front-end accidents following the installation of the track brakes in 1926. It shows, in addition, reduction of accident costs on both the interurban and city lines. These results were achieved despite increases of 15.8 per cent in car mileage operated on the interurban and 29.4 per cent on the city property. At the same time there was an increase of 28.6 per cent in the number of motor vehicle licenses issued in this immediate territory. The record shows an actual reduction of 109 accidents from collision with pedestrians or vehicles. In addition, motormen's reports indicate 322 collision accidents prevented through the use of the magnetic track brakes in emergency.

A summary of the actual financial results of the installation of this special brake equipment is given in Table VII. Briefly, the total cost represented an investment of \$26,602. After deducting all charges we figure that this installation has actually earned a return of 48½ per cent in the direct reduction of accident cost, without attempting to assign any monetary value to the prevention of 431 collisions or potential collisions. No allowance is made in these figures for the saving in catastrophe insurance. Entirely on the basis of the performance of this brake equipment, the insurance companies have made a reduction in the rate for catastrophe insurance applicable to this property from \$2 to \$1.40 per \$1,000 of revenue.

Because this equipment was designed and installed on our cars after they had been in service for several years, it was necessary to carry the brake on an outrigger on the double-truck cars. On a new car installation today, the brake can be included in the original design of the trucks, making a more satisfactory installation and reducing the cost considerably. Nevertheless, with only minor changes and improvements, the design as originally worked out for the Lexington property has proved entirely successful mechanically and has not materially increased maintenance costs. Total air-brake maintenance in 1926 was \$2,538. With the auxiliary track brakes installed and in operation during 1927, the cost of all brake maintenance was \$2,680. In 1928, total brake maintenance costs were \$2,773, the increase of \$235 being almost entirely accounted for by a damage cost of \$153 resulting from a motor vehicle running into the side of

An important maintenance feature resulting from the use of the track brakes is the almost total elimination of flat wheels and the increase of mileage obtained from wheels on both interurban and city equipment.

As used on this property, the track brake is used wholly as an auxiliary brake. Judging from a check which we made in 1927, it is estimated that the average number of applications per year will run between 14,000 and 15,000. In our practice there is no restriction on the use of the magnetic brake.



Twelve light-weight double-truck interurban cars and 27 single truck city cars replaced all of the equipment formerly in service. This represented an investment of \$306,999. In addition, a modern bus service was developed to replace former jitneys

Short Signal Cycles

SPEED UP TRAFFIC

Ву

HAWLEY S. SIMPSON

Traffic Engineer, Essex County, N. J.

XPERIENCE with automatic signals has demonstrated inherent inefficiencies, and much attention is now being directed to the economics of traffic movement at the intersection, which constitutes the critical point of any street system. Through this area passes twice the traffic per lane which approaches on the intersecting streets, and it thus becomes absolutely essential that the most efficient movement of traffic at such points be obtained if traffic stagnation is to be forestalled. One of the greatest, yet most common, extravagances in modern road construction is to invest large sums in super-wide high-

ways, while allowing traffic to be throttled in a "bottleneck" at every important intersection. In general it has been found that the shortest interval which will permit pedestrian traffic to cross with ease is the most efficient interval.

interval.

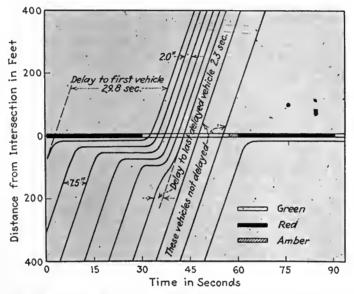
To obtain the maximum efficiency of traffic movement every heavy traffic intersection should be studied with the view to determining whether traffic signals should or

should not be used, or whether the grades should be separated. If traffic signals are considered, it can in general be stated that but two factors should be analyzed and two questions answered, namely:

1. Will the installation reduce the accident toll?

2. Will the installation reduce the volume of vehicular delays below that experienced without traffic signal control?

The first question would receive a negative answer from many engineers in instances where traffic



Vehicular movement at street intersection equipped with automatic signals, showing effect of signals in reducing intervals between vehicles—assumed conditions 480 vehicles per hour moving at 20 m.p.h.; signal cycle, red 30 seconds, amber 3 seconds and green 27 seconds

cident records of intersections where the hazard increased materially following traffic signal installation, often show the hazard returning to presignal level after the signal's removal. An analvsis by the writer of accidents at 52 intersections in twelve municipalities in New Tersey showed an accident reduction of about 35 per cent following automatic signal installation when traffic through the intersection exceeded an average of 1,000 vehicles per hour from 8 a.m. to 6 p.m. But when traffic was below an average of 800 vehicles per hour the analysis indicated that automatic signals were

volume is not heavy. Ac-

not effective in reducing the number of accidents.

Mathematical analyses made recently of automatic traffic signals installed and operated at intersections of light traffic volume have shown unwarranted vehicular delays. Therefore, before a signal installation is decided upon, a careful study of the probable effect of a traffic signal on both the accident situation and the traffic flow should be made. When this is done, and it is determined

that signals are economically warranted, the further question arises as to what would be the most efficient

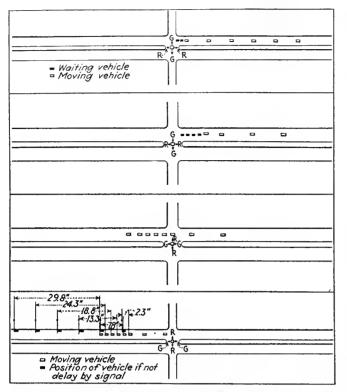
cycle.

In progressive signal systems, the length of the cycle is quite rigidly indicated by the distance between the signalized intersection and the vehicle speeds to be maintained. At isolated intersections and in synchronous systems the length of cycle may range between wide limits. Cycles now used vary from a minimum of about 40 seconds to a maximum of 180 seconds.



Vehicular movement can be expedited to a marked degree by the proper selection of time cycles of automatic traffic signals. It has been found that the most efficient time interval is the shortest interval that will allow pedestrian traffic to cross the street with ease.





Spacing of vehicles before and after passing through signaled intersection, showing delays caused by operation of signals

In order to determine the relative efficiency of various length cycles, the writer has developed formulas from which the accompanying graphs are drawn, and which may be used to determine the theoretical average minimum delay at an isolated signalized intersection under any condition of traffic volume or cycle. Briefly stated, the formulas sum up the delays to each individual vehicle, thus arriving at the total intersection delay. More specifically, the delay to the first vehicle arriving on the stop signal equals the red period, plus a portion of the preceding amber period, plus an acceleration loss, minus a variable to account for the average condition of arrival at the intersection. The delay to succeeding vehicles will always equal the delay of the preceding vehicle minus the difference in time spacing between arriving and leaving vehicles, or 7.5 seconds and 2.0 seconds, respectively, as shown on the chart on page 765. The delay to all vehicles will equal the sum of the delays to the first and last delayed vehicle multiplied by one-half the number of delayed vehicles.

These facts may be readily understood by an examination of this chart, which shows the detailed delays to each vehicle in one lane on one street with an average movement of 480 vehicles per hour. Under the conditions assumed, eight vehicles will pass in each lane in one signal cycle. Of these eight, five will come to a full stop and one will be required to slow down, the delays ranging from 29.8 seconds to 2.3 seconds and totaling 96.3 seconds. Only two vehicles will not be delayed. A series of charts on this page shows the same conditions with vehicles on only one side of the main thoroughfare. The first shows the position of the eight vehicles 15 seconds after the beginning of the display of the red signal, two of the vehicles already having stopped, one slowing down and five approaching. The second shows their position at the end of the red period and the beginning of the green period, four vehicles stopped, one practically stopped and three approaching. These vehicles immediately begin to move and at the end of 15 seconds of the green period all vehicles are in motion, as shown on the third chart, but in the meantime the fifth car has had to stop and the sixth slow down due to the necessity for the first four to accelerate and space themselves at a safe distance.

The fourth chart shows the position of the eight cars, all moving, at the end of the green period. There is also shown the position which the first six cars would have had if there had been no signal at the intersection. The delay to each is shown in seconds, the sum equalling 96.3 seconds.

Incidentally, this figure also demonstrates one of the reasons why signals increase the efficiency of the street system when traffic is heavy. The six delayed vehicles occupied 1,320 ft. of street space when approaching the intersection at 20 miles per hour and required 45 seconds to pass any point. The grouping effect of the signal resulted in the cars being more closely spaced on leaving the intersection, occupying only about 352 lineal ft. of street space, and requiring only 12 seconds to pass a point; an increase in efficiency which warrants the delays imposed when the volume of cross traffic demands it.

A comparison of the relative volumes of delays per hour produced by various length cycles with varying traffic volumes is presented in the chart on page 767. The statistics are computed for only one lane in one direction under the special condition noted in the title of the chart. The total delays for one hour at an intersection may be computed by scaling the delays to each lane from the diagram, provided the cycle is divided evenly between red and green. The same relative increase in delays when long cycles are used will occur regardless of the proportions into which the cycle is divided.

In order to determine the probable accuracy of the formulas and assumptions, field surveys were analyzed by W. B. Powell, consulting engineer, Buffalo, at three signalized intersections. The computed delays using the above mentioned formulas varied from the observed delays by less than two and one-half per cent. Mr. Powell concluded that traffic volume did not warrant traffic signal operation which fact is amply supported by the statistics, while a detailed study of the cycles used gave the following additional conclusions:

1. The cycles were badly proportioned between red and green.

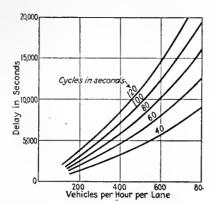
2. The lengths of cycle were somewhat excessive (70, 75 and 80 seconds).

3. The amber period for such light traffic should have been three seconds, rather than five seconds.

If the same length cycles had been proportioned so that the green periods were proportional to the traffic—but no period less than 20 seconds—the delays would have been reduced to 75 per cent of that observed. If a 60 second cycle had been used allowing 40 seconds green on the main street, 20 seconds on the cross street and a three second amber, the delays would have been further reduced to 61 per cent of the actual delay, but the delay to main street traffic would have been somewhat higher in proportion and such a change might not have been justified. This is a very practical illustration of the economic losses due to the unnecessary use of signals in combination with careless or unstudied regulation of the timing.

The conclusion from this study is the evident efficiency of the use of the shorter cycles. The reasons are

apparent by study of the charts. When vehicles are stopped and waiting at the intersection and are ready to proceed at the capacity spacing, it becomes uneconomical to use the cross street for vehicles moving at greater spacings. conclusion This might be carried to the extreme, and cycles of a few seconds selected as most efficient, but such reasoning



Total delays per hour with various lengths of signal cycle—assumed conditions; red is half the total length of cycle and amber is 3

must be tempered with judgment, and consideration given to the rights of pedestrians. The green period must be sufficiently long to permit a group of pedestrians to cross the highway without vehicular interference. An average speed of pedestrian travel may be taken as 5 ft. per second, fixing 12 seconds as the time required to cross a 60-ft. pavement. There must be allowed

some clearance to permit more than one pedestrian to make the crossing and to allow for vehicular interference from turns. This allowance may be assumed as 8 seconds, fixing the minimum practical length of the green period at 20 seconds.

Another and by no means unimportant argument favoring the shorter cycles is introduced by consideration of another element of the pedestrian problem. With very long cycles, as in New York City, the pedestrian cannot be expected or even forced to wait at the curb, as was recently tried, until the green light appears, but will attempt to thread his way through heavy moving traffic, with an attendant increase in accident hazard, and a reduction in the efficiency of the intersection brought about by the unregulated conflict between pedestrians and vehicles simultaneously attempting to move at right angles to each other. Shorter cycles have been found to be productive of greater pedestrian observance of traffic signals with the attendant benefits.

In conclusion, it is apparent that the use of automatic signals cannot but produce delays totaling many vehicle hours per day, in some cases absolutely without necessity, but where studies prove the economic advisability of the use of signals, analyses should be made to determine the shortest and the most efficient cycle that will be practicable.

Third Regional Meeting Held at Boston

BASIC problems facing the electric railway industry were discussed at the third regional conference held at Boston, Mass., on July 10 under the auspices of the Advisory Council. About 40 electric railway executives from the New England territory attended the meeting. This was the third regional conference of this type, the first having been held in San Francisco in February and the second in St. Louis in April.

At the outset of the meeting J. N. Shannahan, chairman of the Advisory Council, announced the selection of Charles Gordon, editor of Electric Railway Journal, to be managing director of the American Electric Railway Association to fill the vacancy created by the resignation of Lucius S. Storrs. The chairman then called upon Mr. Gordon to give his views on the problems confronting the industry. According to Mr. Gordon there is no panacea for the troubles of the electric railways. He pointed out the need for arousing the interest of business men in the problems of local transportation by stressing the relation between transportation and business development and property values. In conclusion Mr. Gordon expressed his abiding faith in the industry and predicted substantial future development.

During the discussion it was emphasized that every effort should be made to arouse business men to realize they have a vital interest in the successful operation of their local transportation systems. The public does not understand the situation because too many railway managements have been inarticulate. Fundamentally the public is even more interested in the soundness of its transportation than the security holders themselves, according to Mr. Shannahan. When the public is properly informed its attitude may be counted upon to be fair. As a result of the work of the management

at Omaha, an extremely unfavorable situation has been completely changed during the past two years and the company restored to favor with the public. His experience there convinced him that other similar situations can be successfully worked out if approached in the right way.

Edward Dana, general manager of the Boston Elevated Railway, said that while the total annual traffic on the system shows a slight decline, the weekday traffic has increased. This presents a serious problem, but does not indicate any decreasing need for public transportation service. He emphasized the need for rapid transit extension. C. V. Wood, president of the railways in Springfield and Worcester, pointed out that transportation must be made more salable by being made attractive. Speed is the most important factor. In 1863 the average speed of the Worcester Street Railway was approximately 8 m.p.h. It is not much better today. Special attention should be given to increasing the speed of operation.

To improve its position materially an electric railway must select a definite objective, according to George Clifford, division manager of Stone & Webster. He cited examples among the Stone & Webster properties to show results when this principle is followed. The human element is important. Employees should be educated to know their business and to make favorable contacts with the public. Prof. A. S. Richey also stressed the importance of securing co-operation from platform men.

Considerable discussion centered around the subject of taxicab operation. Elton S. Wilde, president of the Union Street Railway, New Bedford, expressed the opinion that regulation of taxicabs is highly desirable.

When this is done it may become expedient for the electric railways to enter this field. Henry Page, general manager of the Worcester Consolidated Street Railway, discussed the taxi situation in Worcester and emphasized the need of regulation, as did several other

speakers.

W. B. Spencer, executive assistant United Electric Railways, Providence, suggested that this industry would do well to undertake an extensive advertising campaign to popularize its product. A. J. Boardman, general manager Eastern Massachusetts Street Railway, discussed the need for greater co-ordinated effort among the companies. Fred Gordon, general manager Cumberland County Power & Light Company; O. M. Lord, vice-president York Utilities Company, and A. D. Kendrigan, general manager Manchester Street Railway, all discussed problems confronting their companies.

National Motor Bus Division Reorganized

REORGANIZATION of the National Motor Bus Division was the outstanding result of the third annual meeting held at Buffalo on July 1 and 2. A. M. Hill, chairman, recommended that the work for the ensuing year should be primarily aimed at development of accurate and useful information on the tax situation affecting the industry throughout the country. Upon his suggestion, a special committee was appointed which was given responsibility for co-operating with other agencies working on the same problem. It was recommended also to have all state regulatory bus laws codified in index reference volumes. This was prompted by the fact that many members of the division are operating across state lines or connecting with other interstate operations. This creates a real need for up-to-date information on the status of state regulations.

The opinion was advanced that highway transportation should be regulated on its own merits, without regard to its effect on other forms, because trouble on the highway is increasing and the effect of bus traffic on the railroad is slight and is steadily growing less. It was stated that it was fortunate that the interstate bus bill failed of passage at the last session of Congress, because the power to regulate interstate commerce rests only with Congress and should not be delegated to the

state, as was provided in the bill.

In a report submitted by the legislative committee it was said that while interstate legislation had been the outstanding problem, state regulations had also received a great deal of attention. State bus associations, state legislatures and regulatory authorities have received assistance in the preparation of laws and regulations. It is believed that this work will help establish uniformity in state regulatory practice.

Trailer buses are receiving more attention than in the past. They will double passenger capacity with but slight increase in the maintenance requirements, it was said. The possibilities of light-weight metals in reducing heavy weight are illustrated in a new seat developed for airplane service by the Aluminum Company of America. This is 40 in. wide and weighs only 24 lb., complete with upholstery. It was stated that the design might have to be made stronger and, therefore, heavier for bus application, but even then it was thought that the weight could be reduced approximately 50 per cent.

San Francisco Chosen for 1930 Convention

HAT the 49th annual convention of the American L Electric Railway Association will be held at San Francisco, Cal., was decided at a meeting of the executive committee on July 12. The desirability of holding a convention on the Pacific Coast has been under discussion for several years, and it was felt that it would be particularly appropriate to hold it there next year. The exact date of the 49th convention was not fixed by the committee, but it was decided that it should be held some time in June. This departure from the usual practice of holding the convention during the early fall was made in order to permit delegates attending the railway convention to attend also the annual convention of the National Electric Light Association, which will be held at San Francisco in June. Whether the A.E.R.A. convention will be held immediately before or immediately after that of the N.E.L.A. was not decided.

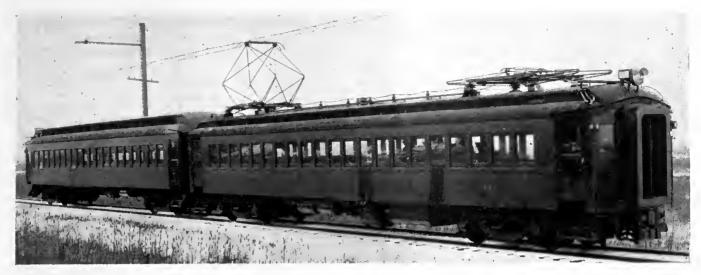
In accordance with the custom that has been followed for some years past, the meeting of the executive committee was held on board the steam yacht *Florida*, belonging to Barron Collier. In the absence of the president and the first vice-president of the association, J. H. Hanna, second vice-president, presided. J. N. Shannahan, chairman of the Advisory Council, announced the selection of Charles Gordon, editor of Electric Railway Journal, as managing director of the association. The appointment was formally made and approved by the committee. Mr. Gordon expressed his appreciation and spoke of the wonderful opportunity of leadership in an industry with an investment of \$6,000,000,000.

At the outset of the meeting, J. W. Welsh, general secretary, announced that he had been offered a position with the Cleveland Railway which he desired to accept. The suggestion had first been made a long time ago, he explained, but he had felt that he could not consider it at the time when the association was without a managing director. Since the selection of a new managing director by the Advisory Council, he felt free to accept the offer of the Cleveland Railway and submitted his resignation to take effect Sept. 1. Mr. Welsh's resignation was accepted with regret by the executive committee, and a special committee was appointed to prepare a statement of appreciation for the services he has rendered the association during his tenure of office.

Routine reports were presented by numerous committees. An interesting discussion occurred concerning the appointment of a committee on fare research. It was the consensus of opinion that such a committee could render the industry an important service.

For officers during the coming year the nominating committee made recommendations as follows: President, Paul Shoup, Pacific Electric Railway; first vice-president, J. H. Hanna, Capital Traction Company; second vice-president, C. E. Morgan, West Penn Railways; third vice-president, G. A. Richardson, Chicago Surface Lines; fourth vice-president, J. H. Alexander, Cleveland Railway; treasurer, Barron Collier.

To fill the vacancies in the executive committee effective to the end of the association year, the nominating committee recommended W. H. Wood, president Virginia Electric & Power Company, to fill the unexpired term of J. H. Alexander, and Thomas Conway, Jr., president Cincinnati, Hamilton & Dayton Railway, to fill the term of D. W. Snyder.



A sample two-car unit for the Lackawanna electrification on the test track

Lackawanna Electrification Plans Completed

LANS for the electrification of the Lackawanna Railroad between the Hoboken, N. J., terminal and Dover via Morristown. as well as the branches to Gladstone and Montclair, now are virtually The main line from complete. Hoboken has three tracks as far as Millburn and two tracks from there to Dover. The Montclair branch has two tracks all the way from the Roseville Avenue junction, while the Gladstone branch from Summit to Gladstone is a single-track line. The entire project involves 70 miles of

route and 160 miles of single track, including main track, yards and sidings. While many details remain to be worked out, bids for the major parts of the work, such as the overhead construction, the cars and the substations, will soon be taken and contracts will be let in the very near future.

The engineering work is being done by Jackson & Moreland, engineers of Boston, Mass., under the direction of G. J. Ray, chief engineer D. L. & W. Railroad.

The immediate electrification will be confined to the suburban trains within the zone mentioned above. These will be operated with multiple-unit cars, arranged in permanent groups of two, a motor and a trailer, which can be coupled to form trains of two, four, six, eight, ten, or twelve cars. Certain heavy freight trains will also be handled between Secaucus and Hoboken freight yards by electric power.

All of the 141 motor cars required for the service will be purchased new. They will be 71 ft. long over bumpers. The trailers with which they will be coupled to form

General plans for this 160-mile suburban electrification are complete and contracts are being let for the equipment and construction. Multiple-unit trains will give suburban service on the Morristown line from Hoboken to Dover and on the branches to Montclair and Gladstone

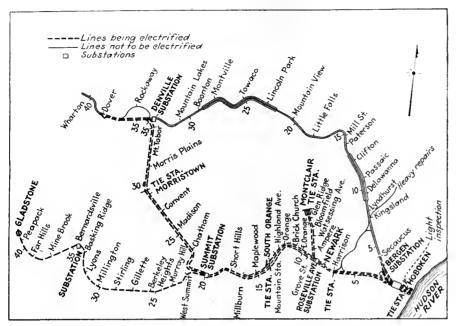


the two-car units are at present in steam service in the suburban district. Sixty, including ten combination cars, are of the so-called low-roof type. They are practically identical in general design and appearance with the motor cars to be ordered. The remainder are of the high-roof type, and include 71 coaches, five combination smoker-baggage cars and five club cars. These cars are all of modern, all-steel construction. The motor cars will weigh 148,000 lb. complete with electrical equipment, and the trailers

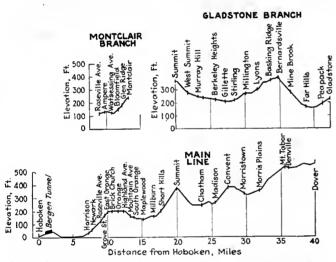
113,000 lb., making the weight of a complete unit 261,-000 lb., excluding passengers. Each motor car seats 84, and the trailer coaches seat 78 or 82, making a total of 162 or 166 for the unit.

Each unit will be semi-permanently joined with MCB type couplers. All operating electrical equipment will be carried on the motor car, and current for the lights and heaters on the trailers will be carried through jumpers between the ends of the cars. Connections between units will carry the control circuits only, and will be made through jumpers. Each two-car unit will have a motorman's control station at each outside end only. Connection with the contact system will be made through two pantographs which are mounted on the motor car.

Each motor car will be equipped with four motors having a one-hour rating of 230 hp. at 1,500 volts. Pairs of motors will be connected permanently in series, and the pairs will be handled with series-parallel control. A feature of the equipment is that the motors will



This map shows the Lackawanna electrification. Figures are miles from Hoboken. Power will be transformed to 3,000 volts d.c. in five rectifier substations



The profile is irregular, there being a rise of more than 500 ft. from the Hoboken terminal to Dover on the main line

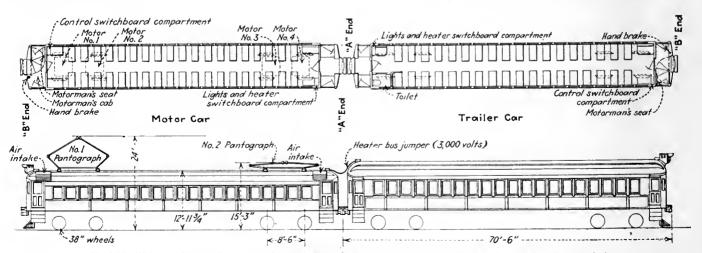
be self-ventilated, the cooling air being taken from the roof of the car at either end, and led to the motors through suitable ducts.

The motor control will be of the multiple-unit, electro-pneumatic type, the magnet valves being actuated with storage battery current. Acceleration will be automatic, although an optional hand control of acceleration is possible. The automatic acceleration has been designed for a rate of 1.5 m.p.h.p.s. with a six-car train. Braking will be at the rate of 1.75 m.p.h.p.s.

Current for the control and for the car lighting will be taken from an auxiliary circuit supplied by a generator forming part of the dynamotor, with a storage battery in parallel, the battery also being charged from this generator. The dynamotor has two 1,500-volt windings with commutators in series. It supplies power from a tap at the mid-point for the 1,500-volt air com-The separate generator pressor. armature on the same shaft supplies 40 to 50 volts for the control, lighting and battery charging circuits.

The heating for all the cars will be by 3,000-volt current taken from the line. There will be 40 heaters in each car, each with two elements. These heater elements will be divided into two circuits, each circuit being connected across the 3,000 volts. The heat control will be thermostatic, the two circuits being connected and disconnected automatically as needed to maintain the desired temperature by means of auxiliary contactors.

The contact lines will be of the catenary type. For the two and three-track sections the wires will be supported on steel bridges. The vertical members will be steel beams of H section, carrying single cross-members. A few four-track sections will be supported with lattice girder bridges. On the Gladstone branch, which is single track, the overhead will be supported from brackets attached to wood poles. Typical construction is shown in the drawings reproduced. The normal spacing of the catenary structures is 300 ft., but this is varied to some extent to meet conditions, as at stations and on curves. Each of the bridges will be supported by concrete footings. These are being placed at the present time. On the meadows, where the ground is little if any above



Trains will be made up of units, each consisting of a motor car and a trailer semi-permanently coupled.

The complete unit weighs 261,000 lb. and seats 162 or 166 passengers

TABLE I—LOCATION AND RATING OF SUBSTATIONS, LACKAWANNA RAILROAD ELECTRIFICATION

tidewater, it has been found necessary to sink piles in order to get a suitable foundation for the concrete footings.

The contact line on the main portion of the system will consist of two contact wires. These and the main and auxiliary messenger cables will be in parallel, with a total equivalent section of copper of 800,000 circ.mil. There will be two No. 0000 trolley wires throughout on the main line.

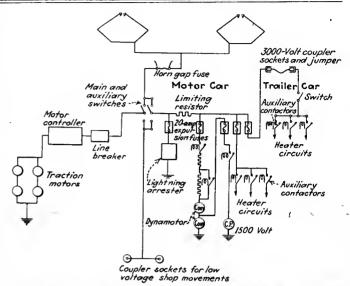
Normally the overhead system will all be tied in together through the substations and tie stations, but automatic switches will be provided that will isolate any section in which trouble occurs.

Power for operation of the system will come from three sources. The Public Service Electric & Gas Company will supply the substations at the west end of the Bergen Tunnel, near the Hoboken terminal, and at Newark, the Jersey Central Power & Light Company the one at Summit, and the New Jersey Power & Light Company the stations at Denville and Bernardsville. Tie stations will connect the overhead conductors for the several tracks together at Hoboken, Harrison, South Orange, Montclair Morristown and Dover.

The power will be converted from 60 cycles alternating current to 3,000 volts direct current in five substations. The locations are shown on the map and the ratings and equipment are given in Table I. Mercury arc rectifiers will be used throughout for conversion. Each rectifier tank will deliver power at 3,000 volts. Three sizes are specified, 3,000-kw. single-tank units being used in the Bergen and Newark substations, 3,000-kw. (two-tank) units in the Summit and Denville substations, and 2,000-kw. units in the Bernardsville station. The Bernardsville station will be equipped for automatic operation.

The main line from Hoboken to Dover has many heavy grades, as may be seen from the condensed profile. There is a rise of more than 500 ft. from Hoboken to the junction with the Boonton branch at Denville. This has necessitated relatively heavy motive power for steam service, particularly on the long run to Dover. With electric power it will be possible to make certain reductions in the running time.

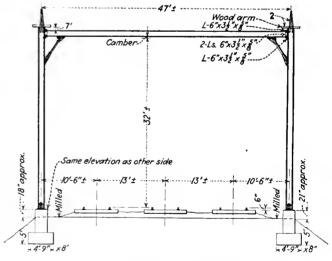
There will be no radical departure from the present plan of operation as carried out with steam locomotives, except that the major portion of the switching movements, particularly at the Hoboken terminal, will be done away with. So far as possible, the trains are kept at the outer terminals over night and are stored in the coach yard adjacent to the Hoboken terminal during the day if they are not needed for the non-rush service. Locals are run on the two outer tracks of the three-track portion, and expresses in the ruling direction of traffic are run on the middle track inbound in the morning and outbound in the afternoon.

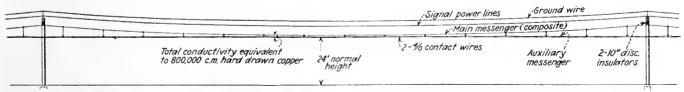


Connections of the major electrical equipment are shown in the schematic car wiring diagram

A shed for light inspection will be provided at the Hoboken terminal. Heavy repairs will be made at Kingsland, about 7 miles across the meadows on the Boonton division. This is the main repair shop for the eastern portion of the railroad, so that the added facilities will be kept to a minimum.

Electrification of the Boonton division is not contemplated at present. The greater portion of the business on this line is freight. By far the larger part of the commuting business, as well as most of the through trains, go out over the division which is being electrified. The through trains will be hauled by steam locomotives for the present.





Catenary suspension of the contact line will be used throughout. Above is a typical three-track supporting bridge

Gross and Net Earnings Are Holding Up

REPORTS of operation of 27 electric railways in the United States and Canada now available show that the revenues are holding steady on the properties included. Out of 23 reports for which comparable monthly figures are given, fifteen companies show greater gross receipts for 1929 than for the corresponding month in 1928. Fifteen of the companies show a reduction in operating expenses for the current year, and eighteen show an increase in gross income after taxes. The disposition of gross income is given for only seventeen of the companies in comparison with last year. Eleven of these show a greater amount available for dividends or surplus.

The best showing is made by the Canadian properties. All the six listed show more revenue this year than last, and every one of them shows greater net. This relatively better showing of the Canadian properties has been commented on previously in this paper. Evidently the causes for it are still in evidence.

The report of the Boston Elevated Railway for the twelve months ended June 30, which is included along with the monthly statement for May, shows a reduction in gross and net revenue, even though operating expenses were lower than for any year since that ending June 30, 1923. The decline in gross, according to a statement from Edward Dana, is continuing and increasing depression in summer riding, and the increase in automobile riding, particularly during the open winter last year. It is pointed out that in spite of the decline in total passenger revenues there has been a substantial increase in weekday traffic for the eight months of the year from October to May, inclusive. Rental charges on rapid transit lines increased by \$291,116 this year as compared to last year.

Table I—Monthly Reports of Electric Railway Companies

	Operating, Revenue \$	Operating Expenses \$	Taxes	Gross Income \$	Net Income \$
Market Street Rali	lway, San Fi	ranelsco, Ca	l.		
June, 1929 June, 1928 12 mo.end.June,1929 12 mo.end.June,1928	779,474 804,151 9,585,383	658,763 <i>a</i> 683,428 <i>a</i> 8,205,287 <i>a</i> 8,342,756 <i>a</i>		120,711b 120,723b 1,380,096b 1,515,379b	61,314 <i>f</i> 58,356 <i>f</i> 649,693 <i>f</i> 749,252 <i>f</i>
Capital Traction C	company, W	ashington,	D. C.		
May, 1929 May, 1928 5 mo.end.May, 1929 5 mo.end.May, 1928	389,304 386,038	263,059 265,386	32,076 26,071	94,727 95,985	64,814 67,728 281,200 309,999
Jacksonville Traci	ion Co., Jac	ksonville, Fl	la.		
May, 1929 May, 1928 12 mo.end.May,1929 12 mo.end,May,1929		77,774 81,625 951,547 1,038,812	9,215 9,286 106,664 107,796	11,3495 12,8636 113,2456 115,0725	47,682 50,741
Chicago Surface L	ines, Chicag	go, III.			
June, 1929 June, 1928	5,118,799 5,090,269	4,015,900a 3,989,114a		1,102,899 1,101,155	848,376e 846,078e
United Railways &	k Electric Co	o., Baltimore	r, Md.		
June, 1929 June, 1928 6 mo.end.June,1929 6 mo.end.June,1928	8,224,067	940,037 930,009 5,766,486 5,574,873	133,435 128,708 819,139 789,127	313,638 310,342 1,893,889 1,933,340	33,710 30,009 195,687 229,674
Hoston Elevated R					
May, 1929 May, 1928 12 mo.end.June, 192 12 mo.end.June, 192	2,978,446 3,013,663 9 34,223,172 8 34,909,542	1,990,084 2,095,826 24,473,329 24,083,391	147,965 158,055 1,695,086 1,793,128	844,765 768,815 8,144,390 8,133,413	148,725 93,651 180,153 82,812
Eastern Massacht	isetts Street	Railway, Be	oston, Mass		
May, 1929 May, 1928 5 Eo.end.May,1929 5 mo.end.May,1928		460,195 514,013 2,265,644 2,392,562	31,258 18,556 168,923 152,425	246,558 215,760 1,407,170 1,469,929	80,661 76,045 468,551 491,005

	Operating	Operating		Gross	Net
	Revenue \$	Expenses \$	Taxes	Income \$	Income \$
Detroit Munici	pal Rallway, D	etroit, Mich.			
Tuno 1020	2 193 665	1,704,344 1,567,295	62,422	437,112 380,000	296,797 232,240
June, 1928 12 mo.end.June, 12 mo.end.June,	1929 26, 329,072	20,888,667	66,965 754,745	4,872,689	3,130,286
		18,286,177			2,860,498
Twin City Kapi 3 mo.end.June, 19	d Transit Comp 929 3,249,703	2,420,058			223,887
3 mo.end.June, 19 6 mo.end.June, 19	928 3,167,779	2,438,194 5,086,338		• • • • • • • • • • • • • • • • • • • •	149,111 686,923
6 mo.cnd.June, 1	928 6,876,251	5,104,546		• • • • • • • •	573,672
	blic Service Co.			12/ 72/	41.050
June, 1929 6 mo.end.June, 19	713,507 929 4,518,265	545,324 3,387,791	41,675 250,050	126,506 880,423	41,959 405,261
	own & Gloversvi	ille Railroad,		e, N. Y.	
May, 1929 May, 1928	84,831 90,121	57,674 61,469	7,840 7,840	23,075 33,908	9,974 1,993
5 mo.end. May, 1	929 430,635	308,611	39,200	95,531	64,262
5 mo.end.May, 1		325,102	39,200	129,086	28,984
June, 1929	hattan Transit 4,167,999	2,741,014	213,036	1,346,674	603,523
June, 1928 12 mo.end.June,	4,055,296	2,603,516 31,256,533	216,075 3,304,036 1	1.322.521	660,890 6,518,372
12 mo.end.June,	1928 47,466,603	30,572,658	3,367,443 1	3,565,561	6,599,211
	ihattan Ra ilroa				
June, 1929 June, 1928	1,006,646 1,018,838	508,250 529,074		498,3965 489,7646	162,265 154,549
6 mo.end.June, 1 6 mo.end.June, 1	929 6,286,633	3,161,902 3,195,448		3,124,7316 3,074,4165	1,108,429
	stchester & Bos		New York.		1,001,171
May, 1929	223,109	121,623	23,974	78,409	137,370
May, 1928 5 mo.end. May, l	207,340 1929 990,151	132,681 627,037	17,813 105,629	58,467 261,116	139,364 797,605
5 mo.end. May,	1928 936,536	619,369	95,319	229,005	764,506
	Railway Systen			370 (00	21 661
May, 1929 May, 1928	1,387,522 1,353,303	1,039,778 1,021,687	88,035 95,949 987,798	278,698 252,799 2,525,944	31,551 46,194
11 mo.end. May	,1929 14,276,172 ,1928 14,217,866	1,021,687 10,969,717 10,908,843	987,798 1,018,143	2,525,944 2,476,399	281,618 70,870
	eet Railway, Ci			-,,	
June, 1929	733,164		59,847	176,052	2,707
	& Western Raily		wn, Pa.		
June, 1929 June, 1928	68,096 71,222			28,943d 28,627d	
	Rapid Transit (
3 mo.end.June,	1929 14,255,943		• • • • • • • • • • • • • • • • • • • •	3,836,208 7,536,182	. 10,575c 109,792c
	1929 28,441,135 y & Terminal C		ac Tor	7,330,102	103,7326
June, 1929	268,829	190,556		72,795	9,240
June, 1928 12 mo.end.June	258,427 2,1929	192,191		63,555 883,653	120,987
12 mo.end.June		• • • • • • • • • • • • • • • • • • • •		783,228	20,948
	ouston Electric		2,565	17 2424	
May, 1929 May, 1928	49,181 54,585	32,251	2,584	17,3436 19,7498	
12 mo.end. May 12 mo.end, May	7,1929 617,174 7,1928 684,590	347,172 399,129	31,665 30,415	238,3366 255,0446	32,508 12,771
	tric Company,				
May, 1929 May, 1929	287,354 282,228	173,236 175,409	25,530	88,5886 81,3726	þ
12 mn.end. May	y,1929 3,383,455	2,086,639	25,445 287,781	346,1926	600,635
12 mo.end.Mag			286,568	354,2956	555,901
	icipal Railway,			22 134	1,697
May, 1928	82,400 73,324 ,1929 432,213	7 54,008 4 45,476		22,134 21,634	2,947
5 mo.end. May, 5 mo.end. May	,1929 432,21. ,1928 386,58	7 244,549 7 228,550		156,341 126,973	35,971 32,342
Edmonton K	adial Italiway, l		ta.		
May, 1929	65.92	3 44.079		19,344	996
May, 1928 5 mo.end.May	61,359 ,1929 372,149	9 44,718 6 224,44 9		15,641 107,696	3,102 15,956
5 mo.end, May	,1928 348,14			98,727	5,011
	nbia Electric R		nver, II. C.		
April, 1929 April, 1928	1,201,20 1,081,40	7 789,071 1 710,175		412,136 371,226	b 6
10 mo.end.Apr	. 1929 11,671,50	9 7,778,484		3,893,025	b
	r.1928 10,960,44			3,497,341	b
April, 1929	Electric Compa 59,03			17,428	
April, 1928	56,05	7 43,505a		15,552	
12 mo.end.Apr 12 mo.end.Apr		3 521,699a 8 521,559a		154,013 139,198	6 85,193 6 70,764
	icipal Railway,				
May, 1929	31,90	2 21,584		8,402	
May, 1928	25,64			5,095	3,222
	unicipal Railw		ı, Sask. 1,198	9 412	5 55
April, 1929 April, 1928	30,35 24.90	16,616	996	7,290	116
4 mo.end.Apr. 4 mo.end.Apr.	.,1929 150,53 .,1928 127,18		5,940 5,087	54,104	20,513
		-,			
	axes. b Net ope				er divideads.

a Includes taxes. b Net operating revenue. c Surplus (leficit) after divideods. d Before taxes. e Balance for return on investment. f Before depreciation and lederal taxes.

Conference Method Effective for

TRAINING EMPLOYEES

Experience of numerous electric railways shows this kind of educational work to be of great value. Methods vary somewhat on different properties, but the basic principle has been applied successfully in transportation, track, overhead line and shop departments

ELIEVING that the efficiency of the human element in electric railway operation is a factor equally as important as the efficiency of the physical equipment, many companies have recently been devoting special attention to educational work among their employees. In these activities the conference method of training has been playing an increasingly important Among the companies which have successfully used this method are the Milwaukee Electric Railway & Light Company, the Boston Elevated Railway, the Cleveland Railway, The Kansas City Public Service Company, the Northern Ohio Power & Light Company, the Chicago, North Shore & Milwaukee Railroad, the Louisville Railway and the Capital Traction Company. underlying principle of the conference method of training is that all those present at the meeting enter into the discussion. In this it differs radically from the older and more familiar method of instruction wherein the instructor does practically all of the talking.

Experience shows that a conference can be conducted successfully only with a comparatively small group of persons who have had a similar background. Under these circumstances all take part in the discussion and contribute something from their own personal experience. Such a group can analyze their jobs so as to better appreciate their responsibilities and discover the best way to develop a smooth-working organization.

The conference method has a wide range of adaptability. It has been used most extensively in the transportation department of the electric railways, but good results have been also obtained in other departments. Among the transportation subjects discussed in conferences are accident prevention and safety work, courtesy, fare collection, relations with the public, methods of training motormen, conductors and bus operators, and proper use of equipment. The general subject of the problems and responsibilities of a foreman or supervisor has been discussed on several properties. At Boston, Louisville, Milwaukee and Kansas City the conference method of training has been extended to foremen in the track, power, rolling stock and shop departments.

The size of the group gathered together for conference training varies somewhat on the different properties, but is necessarily rather small. This method of

education is adapted primarily to the training of foremen and supervisors, although it has been extended under special circumstances to include trainmen and bus operators. In general, the attendance of the conference group ranges from about 10 to 25 members.

Undoubtedly the success of the conference method of training depends to a large extent upon the selection of the conference leader. He should be a man of proper personal qualifications and should never be one who is in a supervisory relation to the persons who are conference members. It is absolutely necessary that he know the technique of conference teaching, that he have an objective and know how to reach it. At present there are relatively few qualified conference leaders, but the number is increasing steadily with the growing interest in this type of employee training.

The conference method of training has been adopted enthusiastically by the Cleveland Railway as one phase of its educational program. This company has used the group conference idea for training men to avoid accidents, particularly those trainmen whose number of accidents have been above the average. The groups have been limited to twelve and the conference has been conducted by the supervisor of accident prevention, who has had each group discuss an actual accident in which one member was involved. The men have decided who was responsible, what could have been done to prevent the accident and what general standards of operation should be adopted. In the opinion of C. D. Smith, superintendent of the personnel department, the results obtained have been most gratifying.

During the past two years the conference method has been used on the Chicago, North Shore & Milwaukee Railroad in the conduct of two distinctly separate training activities. These are: First, the improvement of standards of personal service on the part of those employees whose duties bring them into contact with the customers, and, second, the development of improved standards of foremanship among those charged with supervising the work of others. The meetings have been in charge of a trained conference leader who gives his whole time to the organization and discussion of the conference group. Every effort is made to get a full and unrestricted expression of opinion from the em-

ployees making up the group. Care is exercised that they are given the impression that their knowledge and experience are regarded as having value and that the responsibility for the proper solution of the problem under consideration rests with them. Although it is difficult to measure the results of this training method, the management believes that it has been productive of good results.

At Boston the development of the conference method of training has been an outgrowth of earlier methods which were more in the nature of lectures. In the fall of 1924, group meetings were organized in the four principle operating departments of the company, transportation, track shops and power, as well as a group of women employees. It was early realized, however, that these group meetings did not take full advantage of conference possibilities. More recently the practice has been adopted of holding meetings of the true conference type for men of supervisory rank. According to E. A. Kelly, assistant to the superintendent of transportation, the conference plan has been a marked success. It has caused the men to think for themselves and draw conclusions from their own knowledge of the job. They compare individual experiences and in this way are made to feel that their opinions and suggestions are of value and are given consideration by the officials. The conference gives the employee a renewed interest in his work and makes him feel that he is of importance in the organization. Moreover, much real information and many valuable suggestions have come from the men as the result of these conferences.

The Kansas City Public Service Company at present has four foremen clubs, one each in the equipment, way and structures, electrical distribution and bus garage departments. Each club has its own organization, but nevertheless co-operates with the other clubs. To some extent the activities of these clubs follow the conference method. Their objects are threefold: First, to keep the members in touch with the best modern thought and practice on industrial management and related subjects; second, to provide an opportunity for the exchange of ideas and the discussion of departmental problems; third, to promote social intercourse among the foremen. A man is eligible to membership provided the nature of his work is such that he has foremanship responsibilities regardless of whether he has the direction of only two or three men or a greater number. Also eligible are those closely connected with this work, such as engineers, etc. Each unit meets regularly once every two weeks, from September to May inclusive. The meetings are held on company time. Concerning the results obtained, F. G. Buffe, vice-president in charge of operation, states: "We have found that this is by far the best way to create interest in the work and in the affairs of the company, to improve production and service, to reduce costs and to bring about the friendly co-operation and general good will which are so essential to the successful operation of the property.'

The conference method of training was adopted by the Northern Ohio Power & Light Company a little more than a year ago. On this property the attendance is not confined to the supervisory officials, but includes the car and bus operators. According to L. G. Tighe, assistant general manager, the men feel a keener interest in their work when they have an opportunity to discuss their problems and to bring out their own ideas in open and informal meetings. The management feels that the men are ordinarily in closer contact with operations

than are the officials and supervisors, and are in a position to develop ideas which will greatly benefit service. It is the belief of the company that the adoption of the conference method by all operating companies will increase the efficiency of the men and reflect favorably on the company, both financially and in the development of good will.

On the property of the Capital Traction Company the conference method as a definite educational procedure was first introduced in July, 1928. Since last fall three series of conferences have been held with: (1) A group made up of division superintendents and assistants, who discussed in particular the hiring and training of car and bus men; (2) A group of shop and roadway foremen, who considered such subjects as foreman's cut orders, building morale, personal relations between foreman and other departments. They take a new interest in their men and handle them better. The appreciation of the value of these conferences is evidenced by the fact that each group has suggested additional present day problems which they wish to handle by this method.

To test the value of the conference training method. the Louisville Railway inaugurated the plan soon after the 1926 A.E.R.A. convention. Conferences are held the second Thursday of each month from 7 to 9 o'clock in the evening. Approximately 40 foremen from the transportation, track, shop, power and line departments attend these meetings. Among the many interesting subjects discussed during the 2½ years that these conferences have been in session are: Carelessness on the job; the importance of reporting all accidents and injuries; an energetic, live foreman will be a good example to his men; how the various departments can be of service to each other; how best to impress on the men the fact that they represent the company before the community; service; safety; how to gain the good will of the public; economy; how can the trainman help the mechanical department? how can all departments help the trainman? how can a man of indifferent nature be made into a good workman? a foreman's responsibility; resuscitation and first aid; fundamentals of personal efficiency; etc.

The company believes that by far the most important benefit derived from these conferences is the genuine spirit of co-operation between departments, which has resulted from the understanding of each other's problems. The necessity for cars to be kept moving on an even headway is no longer considered the problem of the transportation department alone, but, on the contrary, each foreman realizes that it is the problem of every man in the organization. G. B. Powell, superintendent of transportation, believes the foreman's conference has been of great value in the education and development of the key man, the foreman, and the company is looking forward to obtaining new ideas and expecting to develop the conferences into even greater usefulness in the future.

"Advertising to Cure Prejudice"

An extremely interesting story of one railway's unusual publicity campaign-to appear in a future issue.

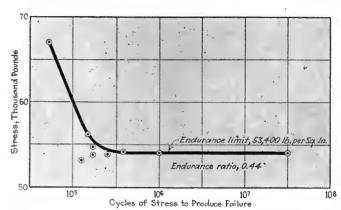
What Happens When

Steel Gets Tired

By

D. D. EWING

Professor of Electric Railway Engineering Purdue University, Lafayette, Ind.



Typical S-N diagram for rail steel. Up to 100,000 cycles the strength of the material decreases rather rapidly

Fatigue of metals is an important factor in failures of track and car construction. This article discusses the causes of the phenomenon and precautions that must be taken in design to minimize the danger.

Crystallization is no longer considered the explanation.

In THESE DAYS when new records of automobile and airplane endurance are being made before the ink used in recording the previous records is scarcely dry, writers in the daily press are fond of remarking about the "tirelessness" of metals and machines. But does metal ever become "fatigued"? If so, what is likely to happen when it is "tired"?

In electric railway operation the materials from which equipment and structures are constructed are often subjected to varying stresses. Car wheels and axles, springs, truck beams, equalizer bars, brake rigging, gears, bolts and studs are all typical elements of equipment which may fail because they become tired. In the track, the rails, spikes, concrete and ties are subject to varying stresses. Trolley wires, span wires, poles and other elements of the overhead system may fail because of fatigue.

WHAT IS FATIGUE?

That when animal muscle becomes fatigued it loses strength, is every-day knowledge. Because of the apparent analogy scientists have given the name fatigue to the loss in molecular strength which some metals and other materials suffer under stresses often repeated. That the application of force first in one direction and then in another is more likely to produce failure in a stick or bar than the application of a greater force in one direction only is a principle that was probably known even among the most primitive of men. However, the first recorded work in the way of analyzing the effects of repeated stress seems to be that of a German, Albert, who made some tests on mine hoist chains a hundred years ago.

Wohler, between 1859 and 1870, made a number of investigations which resulted in the formulation of the first really definite notions as to the result of repeated stresses. He found that whereas 800 applications of a stress of 52,800 lb. per square inch would rupture

wrought iron, with a stress of 35,000 lb. per square inch 10,140,000 applications were required to produce rupture. From time to time other investigators made contributions to the subject and the theory of the phenomena as held 30 years ago is indicated by the following quotation from a standard text book of that time:

Rapid oscillations (of stress) cause a change in the molecular structure which impairs the elasticity of the material when such loads are often applied. It is sometimes found that the appearance of a fracture of a bar which has been subject to shocks is of crystalline nature, whereas the same material, if ruptured under a gradually increasing stress would exhibit a tough fibrous structure. Moving loads which produce stresses above the elastic limit cause the wrought iron and steel to become stiff and brittle and hence it is that the working unit stresses should be taken very low.

This theory of fatigue failure came to have wide acceptance. So prevalent is it today that the fracture of a rail, axle, automobile steering knuckle, engine crankshaft or other machine part subject to repeated stresses usually is ascribed to the deadly work of crystallization.

Within the last ten years a great deal of research has been done on fatigue failure, stimulated no doubt by the necessities for new data for use in the design of automobiles, airplanes, steam turbines and other high-speed machinery.

CRYSTALLIZATION THEORY NOW REJECTED

The disclosures of the metallurgical microscope and other developments in the art and science of metallography have led to a complete refutation of the crystallization theory. Under the microscope, wrought iron, steel and other metals are seen to be of granular structure instead of being of smooth and uniform texture. Instead of stresses being uniformly distributed throughout the material, as we are accustomed to think of them, there are actually many irregularities in the stress distribution. The microscope shows that at high-stress concentration points some of the grains of the metal split and slip because there is a non-uniform distribution of stress

Under repeated stresses the bond between the parts of the split grains eventually breaks down and minute cracks result. The metal fails by fatigue when these cracks have grown progressively until the remaining sound metal is insufficient to carry the load and a sudden break results. In the fracture the earlier cracked surface is usually somewhat smooth—made so by the crack alternately opening and closing—while the fresh break is rough and crystalline in appearance.

The ability of a material to withstand fatigue may be expressed in either of two ways: (1) The stress at which a material stands up under a definite number of cycles of force application; (2) the endurance limit or fatigue limit, that is, the maximum stress which the material can withstand with an infinite number of repetitions of the stress producing force. Another term much in use is the endurance ratio, which is the ratio of the endurance limit to the ultimate tensile strength of the material.

How Fatigue Data Are Secured

The usual procedure in fatigue testing is to select a number of small specimens of the material to be tested. These specimens are tested one by one in a special form of testing machine which subjects the specimen under test to rapidly repeated stresses, the stress for each

specimen being of different magnitude.

For wrought irons and steels, from 500,000 to 5,000,000 cycles of stress may be required to determine the endurance limit, while for cast iron and cast steel over 10,000,000 cycles usually are required. The results of these tests are plotted in so-called S-N (stress—number of cycles) diagram. The accompanying graph is a typical one for steel rails (see Technologic Paper No. 363, United States Bureau of Standards, "Endurance and Other Properties of Rail Steel"). It will be noted that up to 100,000 cycles the strength of the material decreases rather rapidly, while above 500,000 cycles the strength is constant at 53,400 lb.

The reference just indicated sets forth the results of a number of tests on rail steel. The tests were made on specimens cut from the A and B rails of the middle ingots from eleven heats of open-hearth steel. The carbon content of these rails ranged from 0.62 to 0.75 per cent and the manganese content from 0.68 to 0.813 per cent. The data in Table I from these tests are typical of what may be expected from endurance tests on rail steel.

RAILS AND CAR AXLES SUFFER FATIGUE

Steel rails suffer from the repeated stresses set up by the passage of rolling stock over the track. The bearing surface of the rail-head is subject to particularly heavy loading and fatigue doubtless plays a part in such common head failures as surface pitting, transverse cracks, detrusion of the head metal and surface corrugation, as well as in some of the failures of the rail as a whole.

Prof. H. F. Moore, who has had charge of the extensive fatigue investigations being carried on at the University of Illinois during the last ten years, gives the data shown in Table II on car-axle steels (Bulletin No. 165 of the Engineering Experiment Station, University of Illinois).

In these tests the specimens were in a general way similar in shape to a car axle and therefore had somewhat sharp fillets. Sharp fillets produce stress concentrations, and standard fatigue test specimens are designed to avoid such concentrations. Standard specimens cut from the axle of Test No. 3 gave an endurance limit of

TABLE I—ENDURANCE DATA ON RAIL STEELS FROM THE MIDDLE INGOTS OF ELEVEN HEATS

		Strength in Pounds per Square Inch					
Heat Number	Rail	Ultimate Tensile Strength	Endurance Limit	Endurance Ratio			
1	$_{ m B}^{ m A}$	120,400 119,900	47,800 50,400	0.40 0.42			
3	$_{ m B}^{ m A}$	129,750 131,880	55,000 54,200	0.42 0.40			
10 10	A B	132,400 125,650	46,200 47,800	0.35 0.38			
19	A	134,750	59,200	0.44			
20	A	115,750	53,600	0.46			
21	В	121,500	53,800	0.44			

TABLE II—ENDURANCE DATA ON TYPICAL SAMPLES OF CAR
AXLE STEELS

			Strength in	Pounds per So Ultimate	uare Inch—	
Test Number	Car-	Man- ganese	Elastic	Tensile Strength	Endurance Limit	Endurance Ratio
1 2 3	0.45 0.47 0.46	0.49 0.66 0.40	57,000 59,500 40,800	92,000 100,500 91,700	27,000 28,000 24,000	0.29 0.28 0.26
4	0.62	0.43	53,500	105,100	26,000	0.25

TABLE III—TYPICAL ENDURANCE DATA ON QUENCHED PLAIN CARBON STEELS

Per Cent		n Pounds per S	quare Inch—		
Carbon in Material	Proportional Elastic Limit	Ultimate Strength	Endurance Limit	Endurance Ratio*	e Authority
0.24 0.38	47,500 60,000	67,500 91,500	29,500 33,500	0.44	McAdam McAdam
Sorbitic 0.37	80,000	102,600	57,000	0.56	Moore and Kommers
0.49	72,000	126,500	65,000	0.51	Moore and Jasper
1.02	109,000	200,400	105,000	0.51	Moore and Jasper

^{*}Calculated by the author.

35,000 lb. per square inch and an endurance ratio of 0.38. These figures are 46 per cent higher than those in Table II and show the marked effect of specimen shape on the test results.

From these data may be drawn the conclusion—substantiated by the observations of many other experimenters—that commercial forms are likely to have a lower endurance limit than standard test specimens. Standard endurance limit data, then, represent maximum values. For safety the working stresses should be very much lower than the values of endurance limit as determined on standard specimens.

The first thought of the designer of structures or machine parts is usually to make the design with a certain factor of safety based on the ultimate strength of the material. It appears wiser to use the endurance limit as a basis for the safety factor whenever dynamic loadings must be given consideration.

ENDURANCE DATA FOR OTHER STEELS

Other typical data collected from several sources for plain and quenched carbon steels and for alloy steels are set forth in Tables III, IV and V. Data for cast steels, which are much used in rolling stock parts and as such are usually subjected to dynamic loads, are given in Table VI.

The most common fatigue failure in machines and structures is that from repeated flexure and all the above data were made on specimens subject to reversed flexural stresses.

In some machine parts and structures, the stresses are not completely reversed during a cycle of action but range between a maximum and a minimum. For such incomplete reversal the endurance limit is lighter. Moore and Kommers, in their textbook, "Fatigue of Materials.' recommended the following empirical formula:

TABLE IV-TYPICAL ENDURANCE DATA FOR UNQUENCHED PLAIN CARBON STEEL

Per Cent	-Strength in		uare Inch-		
Carbon	Proportional	Ultimate	77 1	E	
in	Elastic	Tensile	Endurance Limit	Endurance Ratio*	Authority
Material	Limit	Strength			Authority
0.14	33,500	62,700	30,900	0.49	Lea
0.21	39,900	70,700	33,400	0.47	McAdam
0.32	37,400	65,700	31,300	0.48	Rogers

*Calculated by the author.

TABLE V-ENDURANCE DATA FOR A FEW ALLOY STEELS Strength in Pounds per

	, S	quare Inc	h		
Material	Propor- tional Elastic Limit	Ulti- mate Strength	Endur- ance Limit	Endur- ance Ratio*	Authority
Unquenched nickel steel	60,800	101,600	54,000	0.53	Moore and Jasper
Unquenched nickel steel Chrome-nickel steel, un-	50,500	103,900	49,500	0.48	McAdam
quenched	55,500	117,800	50,000	0.42	McAdam
Nickel-steel, quenched	139,000	154,200	74,000	0.48	McAdam
Chrome-nickel steel, quenched Chrome-vanadium steel,	129,500	164,500	84,500	0.51	McAdam
quenched	129,500	164,400	92,000	0.56	McAdam

*Calculated by the author.

TABLE VI-TYPICAL ENDURANCE DATA FOR CAST STEELS Strength in Pounds per

 Materia Per Cent Man- ganese 	Condition	Proportional Elastic Limit	mate	ance	ance	
1.71	Untreated Heat-treated	39,000 42,400				Moore
0.68	Untreated Heat-treated	23,600 42,800				Moore
0.82	Untreated Annealed	22,000 28,500				Lessells
0.78 0.18	Untreated Annealed Normalized	22,500 32,000 50,500	90,000	42,000	0.52	Lessells
	Per Cent Man- ganese 1.71 0.68 0.82 0.78	Per Cent Manganese 1.71 Untreated Heat-treated O.68 Untreated Ileat-treated Annealed 0.78 Untreated Annealed 0.78 Untreated Annealed 0.18 Annealed	Material	Square Inc Square Inc	Per Cent Manganese	Naterial

*Calculated by the author.

Maximum stress =
$$S_{max.} = \frac{1.5 S}{1 - 0.5 r}$$
,

where

S = endurance limit for complete reversal; $S_{max} = \text{maximum stress}$ attained during the cvcle;

 $S_{min.} = \min \max$ stress attained during the cycle (equals $-S_{max}$ for complete

 $r = \frac{S_{min.}}{S_{max.}}$ (this will be equal to —1 for complete reversal). When $S_{min.} = 0$, r = 0 and $S_{max.} = 1.5 S$.

When $S_{min_r} = -S_{max_r}$, r = -1 and $S_{max_r} = S$.

Thus the maximum stress due to any cause should not exceed 1½ times the endurance limit when the stress varies between zero and a maximum, and should not exceed the endurance limit when the stress reverses during the cycle of action.

Aside from the quantitative data available, the principal facts and conclusions relative to what happens when "steel gets tired" may be summed up as follows:

- 1. The endurance limit bears a fairly definite relationship to the ultimate strength of the steel. The ratio between these varies from 0.35 to 0.55 for rolled steel and has a mean value of about 0.45. The mean value of the ratio for cast steel is about 0.42.
- 2. The endurance limit is roughly proportional to the Brinell hardness number-Prof. H. F. Moore suggests that it is equal to 250 times the hardness number for steels below 350 Brinell.
- 3. Test specimens with nicks, cracks, grooves, sharp fillets, rough surfaces, etc., may show endurance limits 50 per cent lower in value than for standard specimens.
- 4. The endurance limit is not correlated with the elastic limit or yield point.
- 5. The endurance limit seems to bear no definite relation to the ductility as measured by per cent, elongation and reduction in area.

- 6. Chemical composition does not seem to affect fatigue properties greatly except as it affects the ultimate tensile strength.
- 7. Where localized stresses may exist full-sized shapes have lower endurance properties than the standard test specimens.
- 8. Stresses above the endurance limit, caused either by a heavy overload applied a few times or a light overload applied many times, reduce the endurance limit.
- 9. The maximum stress to which a material is subjected should not exceed the endurance limit when the stress is subject to complete reversal, but may be somewhat higher if the stress simply varies from zero to a maximum in one direction.
- The endurance limit is often considerably below the elastic limit.
- 11 For ordinary speeds of stress reversal, the endurance limit is independent of the frequency of reversal.
- 12. Steel which has been subjected to a large number of reversals of a stress below the endurance limit may show a higher endurance limit.
- 13. Coarse-grained steels and those containing inclusions of foreign matter have lower endurance properties than fine-grained steels.
- 14. Heat treatment usually improves the endurance properties of steel.
- The endurance limit is usually higher if periods of rest 15. occur between the loadings.

Trackless Trolley Installed in Japan

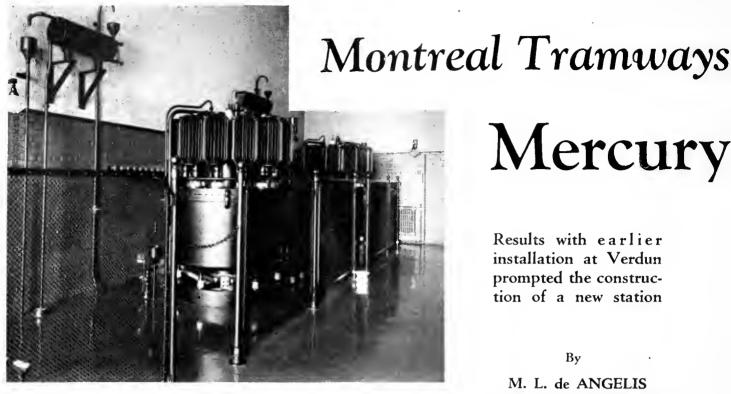
 ${
m R}^{
m ECENTLY}$ two trackless cars were put in service between Shinhanayashiki and Hanayashiki, Japan, by the Hanshin Highspeed Electric Railway, according to the Far Eastern Review. This is the first trackless trolley undertaking in Japan. When application was filed in 1925 for permission to operate a trackless car line, there were no regulations to govern its operation. After prolonged consideration by the local authorities, however, it was decided that regulations governing automobile transportation should be applied to the enterprise and the company obtained the franchise to construct the line.

Shinhanayashiki is a newly opened pleasure resort located near the Hanshin Highspeed Electric Railway connecting Osaka and Kobe, and the trackless trolley line was opened to give service to residents and excursionists visiting the resort. The road on which the cars operate has a width ranging from 7 to 10 meters, the average gradient being I in 10 and the maximum gradient 1 in 7. Each car will accommodate 28 passengers and is equipped with two 20-hp. 1,500-r.p.m. direct-current motors. It has four brakes; namely, electric brake, contraction system foot brake, expansion system handbrake and center foot brake. Trolley wire suspension is of the compound catenary system. Steel poles, imbedded in concrete on both sides of the road at an interval of 32 meters, were erected as supports.

Following the completion of this line, applications for government sanction for other lines have been filed; one in Osaka, two in Fukushima, eight in Ibaraki, one in Ishikawa, one in Yamanashi and one in Aichi.

Electric Operation Profitable in Switzerland

Y THE end of last year 98.5 per cent of the prin-Deipal lines of the Swiss Federal Railways had been electrified. Results of operation of the Federal Railways for the year 1928 were very satisfactory, the net profit being 17,000,000 francs. Gross earnings increased from 395,500,000 francs in 1927 to 418,000,000 francs in 1928, while gross expenditure rose only slightly and totaled 254,000,000 francs.



At present two 1,200-kw. rectifiers are installed in the Rockfield station. provided for two additional units

Mercury

Results with earlier installation at Verdun prompted the construction of a new station

 $\mathbf{B}\mathbf{y}$

M. L. de ANGELIS

Assistant Electrical Engineer Montreal Tramways, Montreal, Canada

PROGRESS in the design of rectifying equipment has been so great in the past few years that when, after experience of nearly two years with the Verdun substation, the Montreal Tramways decided to install a second automatic substation using rectifiers it was found possible to make a considerable saving in size and arrangement of the units. The earlier installation was the subject of an article in this paper for April 30, 1927, page 766. Originally two rectifier units, each consisting of two 600-kw. cylinders, were included. Later a third unit was installed, bringing the capacity of the Verdun station up to its designed maximum of 3,600 kw. The dimensions of the building were ap-

proximately 37 ft. 6 in. x 79 ft. 6 in. x 34 ft. high, or 28.2 cu.ft. per kilowatt installed capacity.

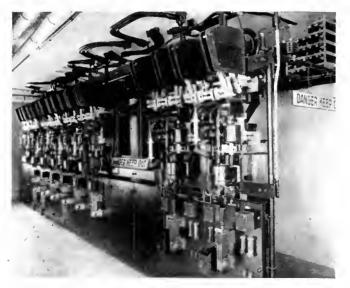
Before the new Rockfield station, which is located in the suburban town of Ville St. Pierre, approximately two miles west of the Montreal city limits. was designed, the progress in mercury arc rectifiers had been so great that the Brown-Boveri Electric Company, which through Griswold & Company, Ltd., of Montreal, furnished the equipment for both installations, was able to supply rectifiers delivering 1,200 kw. from a single cylinder of a size only slightly larger than

that of the 600-kw. cylinders at Verdun. Switching and control apparatus have likewise been refined. It was found possible to construct a building 78 ft. 4 in. x 36 ft. 3 in. x 30 ft. high to house all equipment for four 1,200-kw. units, or a volume of 17.7 cu.ft. per kilowatt of ultimate capacity. At present only two units are installed.

The substation is built of brick with a concrete basement, carefully waterproofed. The main rectifier room is finished in red brick, with concrete floor and roof. The high-tension oil circuit breaker cells and bus structure are along one side of the main room, while the rectifier units are on the opposite side. The circuit

breaker cells are built of concrete, and are enclosed at the front by fireproof cell doors. An I-beam supported from the roof immediately over the rectifiers carries a 5-ton chain block for use in dismantling them. The floor of the transformer compartment rests directly on the ground. As the rectifiers are light in weight, no special foundations were needed.

The basement has a ceiling height of 9 ft. It contains the main room in which are placed the auxiliary devices and the reactors, a furnace room and a toilet. To ventilate the basement there is one large



The direct-current feeder switchboard is on the floor directly below the a.c. control board

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Extends Use of

Arc Rectifiers

opening in the wall, which is equipped with shutters and screens. Flues are provided to exhaust the hot air from the recoolers. The building is fireproof throughout.

Energy at present is supplied by one 12,000-volt threephase, 60-cycle aerial feeder, but switching equipment is available for an additional one. The oil circuit breakers on these feeders are not of the self-closing type, but must be closed by suitable control switches on the substation switchboard.

Each rectifier unit consists of one 2,000-amp., 600-volt cylinder fed from a three-phase double-six-phase 12,000/490-volt transformer of the oil-insulated, self-cooled type for outdoor installation, an ignition-excitation set and the necessary vacuum pumps. The rectifier unit weighs 6,100 lb. and the complete transformer 21,200 lb. For feeding the trolley lines there are six 2,000-amp. feeders, with a blank panel for two future feeders.

The rectifiers are cooled by a closed water circulating system, with a radiator-type cooler. Circulation is by centrifugal pumps and blower fans are used to force air through the radiator. The air is taken in from the



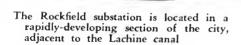
The control switchboard handles all the alternating circuits of the entering lines and the input to the rectifiers. The vacant panels are for two additional rectifiers

heavy wire screens and may be closed entirely by Kinnear rolling steel doors. Louvers in the walls above the doors, and ventilators in the roof provide for additional ventilation. A feature of the transformer installation is that each transformer is mounted on a truck which runs on a track at the level of the deck of a flat car which may be run on a siding alongside the building.

OPERATING STATISTICS OF ROCKFIELD MERCURY ARC RECTIFIER SUBSTATION, MONTREAL TRAMWAYS, JAN 5 UP TO JUNE 1, 1929 Unit Unit Total

	No. 1	No. 2	Average
Hours of operation. Output in d.c. kilowatt-hours.	1,548.36 597,870	1,598.26 594,960	3,146,62 1,192,830
Input in a.c. kilowatt-hours			1,285,480
Average efficiency including all auxiliaries, per cent			92.5
Maximum d.c. load on station, kw	30,960	31,960	1,210 62,920
service, hours	23	0	• • • • • • •
cent of total	0.66	0	• • • • • • • • • • • • • • • • • • • •

Transformers are housed in individual fireproof compartments, with tracks in the floor at the height above the railroad siding of a freight car platform. Kinnear steel doors protect them from the weather

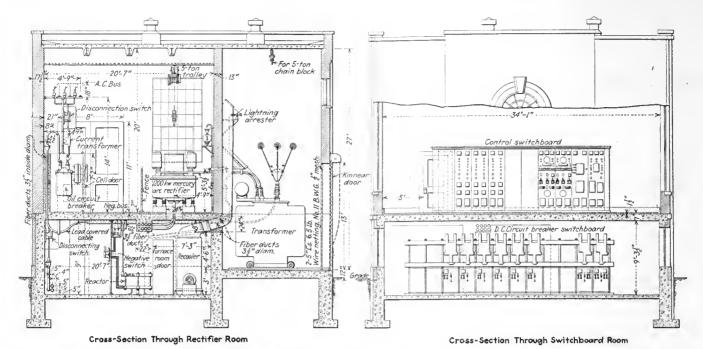


basement and is discharged through flues from the building. The highvacuum pumps are cooled with city water, but their consumption is small.

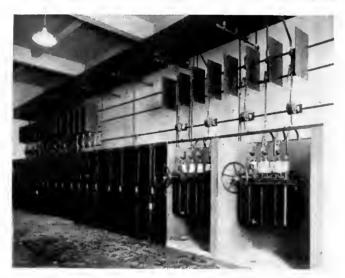
The transformer cells are at the side of the building nearest the rectifiers and are separated from the interior by a fireproof wall. They are roofed over, but the fronts are left open for removal and for ventilation. They are protected with



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Sections through the main rectifier room and basement and through the switchboard room. The a.c. control switchboard is on the main floor and the d.c. feeder board is beneath at the basement level

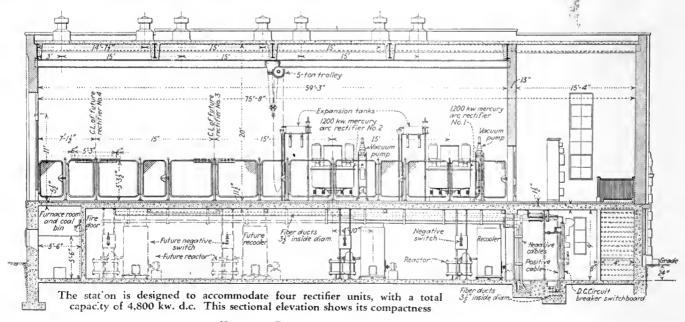


The high-tension of treakers are housed in contrate compartments in the main room

An innovation in the Rockfield station is that the main control switchboard is in a separate room in the front of the building. It contains the operating switches and automatic control for the entire station, except for the direct-current lines. The feeder board is in a separate room in the basement directly beneath the main control board. The wiring between the two is thus made short and direct.

The equipment is so designed that the station is entirely automatic. It will start either at a predetermined value of 540 volts d.c. on the trolley, by clock or remote control. The sequence consists in closing the high-tension rectifier circuit breaker, starting the vacuum pumps, the ignition and the excitation anodes, and closing the d.c. rectifier breaker on the 600-volt bus. It can be disconnected automatically either at a predetermined low value of about 10 per cent of full load, by clock or by remote control.

The rectifiers are protected against overload, arc-



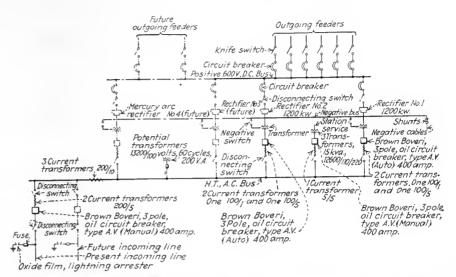
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backs, overheating of anodes, failure of vacuum and of cooling water. In the event of an overload or a short circuit the breakers will reclose after each tripping for three times at predetermined time intervals. After this, if abnormal conditions still prevail, the unit or units are locked out. The circuit breaker also will trip and be locked out by excessive heating of the rectifier, by failure of cooling water, by reversed phase or single-phase conditions, or by excessive low vacuum. The plant will not restart until the inspector has reset the lockout switch.

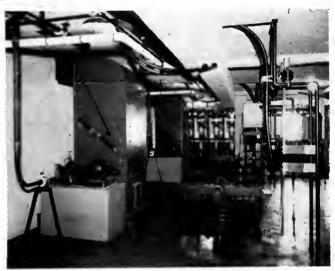
The mercury condensation highvacuum pumps always are in operation when the rectifiers are in service, but the rotary or roughing pumps operate only according to the degree of vacuum in the rectifier cylinder.

The d.c. feeder breakers are independent of the rectifiers and normally are closed. If tripped by overload or short circuit, they reclose automatically three times at predetermined time intervals. If tripped after the last reclosure they are locked out and must be reset by the inspector.

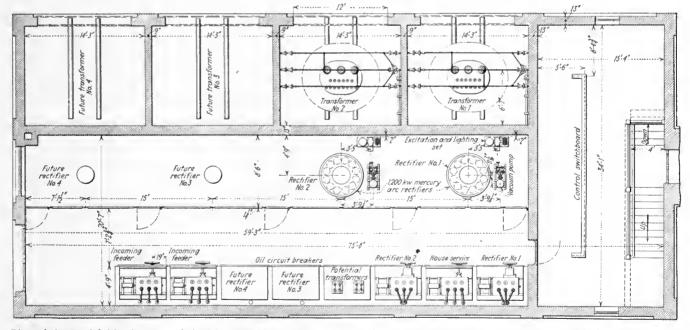
The station feeds the Lachine and Montreal West divisions of the Montreal Tramways. The building was begun in the spring of 1928 and completed in the fall of the same year. The equipment was then installed and was placed in service on Jan. 5 of this year and has been in service continuously since then, being in operation for 3,146.62 hours out of a total of 3,504 hours of elapsed time. One rectifier has been available for service throughout this period, and the other was out of service 23 hours, or 0.66 per cent of the total time. Because of the present distribution system the station cannot be loaded more heavily, but contemplated changes will in the very near future allot more load to the equipment. Operating statistics are given in the accompanying table.



This one-line schematic diagram shows the connections of the two rectifiers installed and the provisions for the two future units. Every effort has been made to keep the equipment simple and reliable



In the basement are located the recooler, the reactors, the negative bus and the house transformers. The reactors shown in the foreground are to eliminate telephone interference



Plan of the Rockfield substation of the Montreal Tramways. The transformers are in separate compartments, with fire walls between each other and the main operating room. The switchboards are in a separate section at the front of the building by a fire wall

Promotion of

More Profitable Business

Outstanding Topic at C.E.R.A. Convention

EMBERS and guests of the Central Electric Railway Association assembled at the Golfmore Hotel, Grand Beach, Mich., on June 27 and 28 for a convention, which was one of the most interesting and profitable meetings ever held by the association. The sessions were all well attended, and much interest was shown in all the papers presented. The outstanding feature of the two-day program was a symposium on the promotion of more profitable business, sponsored by D. R. Thomas, president of the Electric Railways Freight Company. Papers on the fundamental problems of the industry and subjects of special interest gave the program excellent balance. The sessions were presided over by President L. M. Brown, vice-president Interstate

Public Service Company, Indianapolis, Ind.

The symposium arranged by Mr. Thomas was participated in by seven speakers, who developed the subjects of urban railway business, freight business, truck and trailer interurban operation, express service and advertising. The first paper of the group, on "Promotion of More Profitable Urban Railway Business," was presented by R. N. Graham, manager of railways Penn-Ohio System, Youngstown, Ohio. Mr. Graham pointed out the various factors that have been responsible for the large increase in revenue on his system, emphasizing particularly the results of instituting the weekly pass. He stated that the most logical way to build up more business was to encourage riding in the off-peak hours, when the cars usually carry light loads, by offering the public this service at a more attractive rate. Mr. Graham pointed out the effectiveness of the weekly pass in building up this off-peak riding and how it was proving a time saver to both the patrons boarding the cars and the operators. He also asserted that the pass was serving as a good-will builder for his company.

The promotion of a more profitable freight business for the electric railway means the promotion of a more profitable service for the customer. Business means service, and unless service is rendered there will be no business—and by service is meant actual performance and not clever conversation." Developing this thought, Frank W. Gerlach, assistant to the president Electric Railways Freight Company, Cleveland, Ohio, pointed out that it is necessary for the electric railways to render the service required by the public in a more satisfactory manner than can be rendered by any other carrier. According to Mr. Gerlach, to meet fully the freight transportation requirements of the public and to promote business in the greatest degree, the electric railways must do one or more of the following things, dependent upon the local conditions affecting the operation

of each company:

1. Co-ordinate rail and truck operation, so as to serve off-line points, these truck lines to be used as feeders for the electric railway lines.

2. Provide the shippers and consignees with pick-up and de-

livery service.

3. Render container service to attract the higher class com-

modities now carried by truck companies.

4. Encourage the development of carload forwarding companies that will specialize in handling business over the electric railway

lines.
5. Take advantage of profitable opportunities to co-ordinate electric railway facilities with those of steam railroad, water

navigation and airway companies.

 Operate freight trains on limited passenger train schedules.
 Fix the departure of trains at hours most suitable to the shipper, and maintain a force at terminals to meet requirements of the shipper and consignee.

8. Develop the initiative and promotional ingenuity of the sales organization and station agents.

9. Utilize the purchasing power of the company.
10. Improve the appearance of electric railway freight equip-

Development of an extensive truck and trailer operation in southern Michigan, as well as between Flint, Saginaw and Bay City, by the Southern Michigan Transportation Company, was described by G. W. Quackenbush, traffic manager Michigan Railroad, Grand Rapids, Mich. Mr. Quackenbush could not give a comprehensive report as to the operating efficiency of the system nor figures as to the value of traffic handled, since the new service was instituted only recently, but he did give a clear picture of the character of service offered and the extent of the company's system.

REVENUE POSSIBILITIES IN EXPRESS SERVICE

Real express service on electric railways was the subject of a paper by F. W. Brown, general manager Electric Package Agency, Cleveland, Ohio. Mr. Brown explained the character of the service which his company offers and pointed out that real express service is a distinct field, entirely separate from and non-competitive with any other class of service offered by electric railways. He showed that the service could be instituted practically on almost any interurban system and outlined the many advantages of such an express service. An abstract of the paper accompanies this report.

"It is axiomatic," stated W. S. Rodger, traffic manager Eastern Michigan Railways, Detroit, Mich., speaking on the subject of public demands on our transportation system, "that our patrons are demanding speed. safety and comfort from transportation companies in a constantly increasing manner. The demands made upon us for improvements," he continued, "may be the result of our competitors stepping faster than we do and inaugurating methods, which we have silently realized were desirable, but which were withheld from adoption until we were forced to do so, because of inertia or lack of

capital. It is also true that competitors have been stirred to action by our efforts. The continued advancement that is being made in our industry is the result of development by all who are engaged in it, and it is up to us to keep at the head of the parade of progress if we expect to succeed and get our share of the constantly

increasing volume of traffic which is offered for handling by some means or other. We cannot afford to sit idly by and let the private automobile handle the passengers or the highway truck handle the freight."

The final speaker of the symposium on the promotion of more profitable business was Labert St. Clair, di-

Real Express Service Offers Revenue Possibilities

By F. W. Brown General Manager Electric Package Agency Cleveland, Ohio

ELECTRIC railways, keen for new sources of revenue, will find in express service a source entirely undeveloped and with With proper encouragement and very promising possibilities. development it can be made into a profitable activity, not competitive with any other class of service but bringing new shippers

into the fold and creating entirely new revenue.

Express service must not be confused with fast freight. different class of service, to serve a different class of shipper. It's the terminal service on shipments and other special features that distinguish it from freight service. The two services do not conflict in any way, and the demand for one is not satisfied when supplied with the other. The public has more in mind when demanding express service than rapid movement between two points. It may have in mind the free pick-up or delivery at point of origin or destination, or that such pick-up would be made long after freight houses are closed, or delivery at destination for an early market, also long before freight shipments would be available. Again, it may desire that the invoice price of the shipment be collected before the consignee can get possession, it might carry an unusual value making insurance desirable or the shipment may be routed over a transfer point, in which case there is often 24 hours quicker service by express than by freight. These are some of the features that the public quite likely has in mind when demanding express service.

The pick-up service at point of origin gets to the small shipper who does not maintain his own truck. It is usually cheaper to call for the express company than to hire a truck to take the goods to the freight house. It also furnishes service without regard to the closing regulations of freight houses.

Delivery service at destination is another feature which the control of the property of the p

freight department cannot supply at the rate charged for freight transportation. Delivery at 4 a.m. on the market, often with C.O.D. collection to be made, department store purchases of the previous night that must be at the door when the store is opened the next morning, and delivery of individual packages are examples of service that would be impossible by freight.

The classification provided by the express companies permits of the handling of shipments without the same rigid requirements as to containers and packing insisted upon by freight. Trunks and suitcases are handled under a seal, household goods without the necessity of crating and boxing as when sent by freight, and the higher rate secured for the service is based on those conditions.

A great many C.O.D. shipments are handled where the collections are small, and other times when they run into a large amount, but with the rapid movement of shipments by electric freight it is impossible to get an order bill of lading through the bank as soon as the shipment reaches destination. Therefore the handling of C.O.D. shipments by express allows the shipper to get his merchandise to the consignee and collection of the charges at the same time. It also provides an additional source of revenue in the return of money to the shipper.

Ordinary express rates are based on a valuation of \$50, and if the shipment carries a greater value an additional charge is made. Therefore, it is possible for a shipper to place the true value on his shipment, pay the necessary fee and have the merchandise

Express rates are usually of two classes, first and second, the first class rate being approximately three times that of first class freight and the second class rate about 25 per cent less than first class. Food products generally fall into the second class.

Express service as described is offered on the electric railways operating into Cleveland and on some of their connecting lines by the Electric Package Agency, which started its service at Cleveland more than 25 years ago, long before freight service was provided on these lines. When regular freight service was instituted the Electric Package Agency continued to serve as an express carrier only. It now provides almost identically the same service on the electric lines over which it operates as the American Railway Express provides on steam railroads.

Complete merchandise express service is provided by the Elec-

tric Package Agency over the lines of the Lake Shore Electric Railway; the Cleveland, Southwestern Railway & Light Company; the Northern Ohio Power & Light Company; the Pennsylvania-Ohio System; the Stark Electric Railroad, and to Detroit over the Eastern Michigan lines. It is an entirely separate organization, the directors being the managers of certain of the lines over which it operates, but its management, accounting, supervising and soliciting are entirely separate.

Under the contract with the railways every phase of the service except the actual transportation between point of origin and destination and the station service at such points is performed by the Electric Package Agency. This includes responsibility for shipments between shipper's door and warehouse at point of origin and after received from the railway at destination, supervising, soliciting, advertising, auditing and costs of necessary supplies. The railway receives a shipment from a driver at a point of origin, bills it on an Electric Package waybill and delivers it to a driver at the destination, who collects charges and returns same to the agent. Thus the service performed by the railway is less than for interline or local freight shipments, as no accounting, except that of the local agent, is required, nor is warehouse storage space needed. The average rate received by



Trucks used by the Electric Package Agency for the collection and delivery of express shipments in Cleveland

the railway for this service is 12 times first-class freight rate on local shipments and above first-class freight rate on inter-line shipments. Each railway is furnished a settlement report by the 15th of each succeeding month, together with a check for its proportion of earnings.

The advantages of express service may be summed up as follows: The rates charged are the same as those of the old line express company, which are about three times first-class freight rates and, after deducting the cost of the extra terminal service, leaves to carriers a rate per 100 lb. above first-class freight rate, about double the average per 100-lb. rate received for freight shipments. The service adds new business at this for treight shipments. The service adds new business at this high rate which cannot be seemed unless you supply all of the features of this class of service, and which the shipper is paying for but finds is essential. It does not conflict with any other class of business you are now handling, either "dispatch freight" or regular freight with free truck service for large shipments. It does not add greatly to operating costs, and in many cases adds nothing at all. It adds a new shipper to your line, who brings the business to your warehouse and takes it line, who brings the business to your warehouse and takes it away promptly, thus not congesting your terminal, and it pays you liberally and well for your service.

rector of advertising American Electric Railway Association. Mr. St. Clair confined his remarks to the securing of newspaper publicity, advertising that does not cost. He stated that the public is interested in stocks and business at the present time, and that newspapers are anxious to receive public utility news. Have a reporter call if you have something of interest for the newspaper, was the advice of Mr. St. Clair. He urged that all contributions be made brief and suggested as likely material, speeches, live pictures and editorial thoughts.

Likening the flat and cut rate taxicab operations in

the country to a virulent disease with the unhealthy ability to spread throughout the country with disastrous results, H. A. Inness Brown, editor of *Taxi Weekly*, urged that the electric railways co-operate with the legitimate metered taxicab companies in battling this evil. Mr. Brown indicated that the present expansion of cut rate taxicab operation is similar to the jitney peril, which so seriously injured the electric railways several years ago, before being forced out of business. Mr. Brown's paper appears in abstract below.

"One of the foremost problems facing the street railway industry is the formulation of its policy with regard

Flat and Cut-Rate Taxicabs a Serious Menace

By H. A. Inness Brown
Editor "Taxi Weekly"

F LAT and cut-rate taxicab operations, in spite of being basically unsound, constantly demonstrate the unhealthy ability of a virulent disease to spread throughout the transportation system of this country. There is nothing really new about this disease. The railways had an attack of it just about fifteen years ago. At that time it was called the "juney peril."

The street car companies, being unprotected by proper legislation, were seriously injured by these jitneys, some of them being actually forced out of operation. Gradually, however, by drawing public attention to the menace, and by obtaining proper laws against such unfair competition, the jitneys were forced to discontinue. But before such legislation could be obtained hundreds of thousands of dollars had been lost by the street car companies as well as by the jitney operator.

as well as by the jitney operator.

Meanwhile the taxicab business developed. Companies built up good service and a following by furnishing comfortable, standardized cabs with capable, polite drivers. They created the measured mile so that the passenger might pay at a reasonable rate for the actual transportation used. The tendency was to complete personal service with better taxicabs and better drivers.

complete personal service with better taxicabs and better drivers. From 1914 to 1928 the legitimate cab companies prospered. They attracted capital. They made friends. It looked as if nothing could wreck or hurt the business. But in the business itself there were growing up a number of men who knew nothing about costs but who saw an opportunity to "put over, something" on the old-time taxicab operator. The taxicab business was suddenly subjected to a similar disease as that which attacked the street railway companies in 1913. Here's how it occurred:

In the spring of 1927 a cab driver in the city of Rochester, N. Y., who had been discharged by his employer, conceived the idea of establishing a cab company which would operate upon rates of fare much lower than those in existence. He received credit from pleasure car dealers from the tire convenies and

In the spring of 1927 a cab driver in the city of Rochester, N. Y., who had been discharged by his employer, conceived the idea of establishing a cab company which would operate upon rates of fare much lower than those in existence. He received credit from pleasure car dealers, from the tire companies and from the gasoline and oil people. He brought his cabs out at a cut rate of 25 cents and obtained a great volume of business immediately—some of which came from former taxicab patrons of the legitimate taxicab company and some of which came from the street railway company.

All of this business, however, was obtained at a loss and the company was finally abandoned and its promoter had to go elsewhere. Either through his own efforts or through some of his friends, he established, however, other cab operations in Syracuse and Utica. The idea began to spread. Money, taxicab drivers were told, could be made by operating at cut rates. Almost immediately cut-rate operations started in various parts of the country, most of them being financed by pleasure car dealers.

While this Rochester operator did not make money for himself he had caused great losses to the legitimate cab business in the various cities where he had started operations, often forcing the legitimate cab company to reduce its prices so that it in turn competed with the street car companies for riders. For a brief time, it looked as if this new sort of flat-rate operation was profitable. The cars were new and they needed little attention. Soon, however, depreciation began to get in its work—and the cab companies, including those started by the original promoter, began to look for a way back to higher rides and reconstruction.

prohtable. The cars were new and they needed little attention. Soon, however, depreciation began to get in its work—and the cab companies, including those started by the original promoter, began to look for a way back to higher rates and measured miles. A good example of the outcome of this type of operation is afforded in Columbus, Ohio, where, after a comparatively short period, three companies went bankrupt and Cy Hill, the driver who introduced the flat-rate cabs, left town. His company was overwhelmed in debt, his drivers unpaid, judgments unsatisfied and his cabs worn out. The legitimate cab companies lost money by the invasion and the electric railway suffered a severe reduction in revenue during the period.

But the picture of Columbus might well be the picture of any reasonably large town in America. More than 100 cab companies, which attempted flat rates in the last year, are now in the process of reorganization or liquidation.

It is unfortunate that these failures are not solving the problem of cut rates. Promotions of cut-rate cabs are still going through the country. These promotions are based on the product of one of the largest cheap car manufacturers in America. The method is to offer the cabs for sale to the legitimate cab company. If this company cannot buy them, because they are unsuitable to cab operation, the automobile company's representatives then offer them to the drivers or form a company to operate them at a rate below the standard. The result is a taxicab operation below costs—a taxicab operation that offers a ride at street car prices—a taxicab operation that makes no money but makes everyone in the transportation business lose money.

This problem may seem to be only a taxicab problem. But is it really limited to taxicabs? Has it any effect on the revenue of the street railway company? I believe it has a devastating effect. In Seattle, for instance, the electric railway there reported a loss of \$800 a day, due to flat-rate operation. In Columbus a 25 per cent reduction in the number of street car riders occurred during the height of the flat-rate war at a cost of about \$20,000 a month to the railway. In Providence the railway said that unless something was done to give them protection from flat-rate taxicab operators that they would be forced to abandon their franchises. In Worcester a similar condition existed, while in at least five other cities of reasonable size, including Richmond, flat-rate operation caused a loss of from \$250 to \$2,000 a day to regular street car lines.

138 CITIES HAVE CUT-RATE CABS

Cut rate operations, running at rates per person below the fare on the electric railway lines, have been established in Dayton, Columbus, Akron, Cleveland, Providence, Boston, Baltimore, Rochester, Richmond, Charleston, S. C., San Francisco, Seattle, San Diego, Cincinnati, Louisville, Detroit and 122 smaller cities.

In the West there is one cab company, operating at an extremely low rate, that is planning operations throughout the West and Middle West at rates below the cost of operation. This company's plans, as announced to the public, included the establishment of cut-rate cab companies in small cities as well as larger centers. They state frankly that their form of operation, which gives only transportation to the passenger, without any frills, is likely to cause the legitimate cab company great loss in business. They are after volume—the greatest number of riders at the cheapest possible price. This is vital news. It means that something must be done to prevent a new crop of cut-rate cabs.

The only real solution possible is protective legislation. And such legislation, if it is going to be really protective, must be sought by the electric railways as well as the taxicab companies. The cut rate business hurts the railways as much as it hurts the taxicab man. The taxicab company can meet the competition by cutting rates, but the railways must keep the same rates and fight the competition by the best possible service. If they are going to have the competition of the converted pleasure car or jitney lines, they must find some means of fighting it.

In the wake of flat-rate operations follow bankruptcy petitions, greatly increased traffic hazards, violations of municipal and state laws, demoralization of the transit lines, and an increased volume of rides at a loss. These are facts that force the thinking men in the taxicab business and in the electric railway business to

realize that something must be done.

to bus operation." With this statement, Thomas Fitzgerald, vice-president Pittsburgh Railways, Pittsburgh, Pa., launched a discussion on the fundamental principles involved in determining the bus policies of an electric railway. "The adoption of a hard and fast policy," Mr. Fitzgerald continued, "is believed to be impracticable, if not impossible. If we grant that the success of policies of public utilities in a large measure are dependent upon meeting and satisfying public opinion, it is self-evident that the bus policy of an electric railway must be adapted and adaptable to changing public opinion. Such a policy should be sufficiently flexible to meet the changing conditions not only in the field of bus operations as they develop, but in the field of electric railway operations as well."

In reviewing the elements which have contributed to the problem of determining the proper bus policy, Mr. Fitzgerald first pointed to the development of automotive vehicles and their effect. He held that it would be unwise to assume that the time has come to determine upon a definite policy toward the bus, in view of the continued expansion of the automotive industry. He warned that if railways continued to offer street car service, which is generally very little different from that offered to a former generation, and if at the same time, bus facilities and service are developed rapidly along modern lines, the effect on the public attitude must be unfavorable to the railway and favorable to the bus.

Mr. Fitzgerald named economy, through which more frequent car service may be provided, speed, reliability of service, greater comfort and elimination of noise as necessary elements in improving the railway service. He stressed the fact that public attitude toward electric railway management, over a long period of time, is based upon the efficiency with which the service is rendered. "This efficiency," he stated, "is directly dependent upon the financial strength of the electric railway, and the management, therefore, must preserve the financial and physical condition of their facilities to obtain success. From this viewpoint, the indicated policy toward the hus operation is that of employing the hus only when the results contribute to the economic well-being of the railway and bus facilities combined." Mr. Fitzgerald listed the fields in which the bus has been demonstrated to be effective and other developments that hold promise.

John R. Blackhall, general manager Chicago, North Shore & Milwaukee Railroad, Highwood, Ill., speaking on the subject of improved interurban operation, named as the three main factors to consider in the operation of an interurban railroad the public, the employees and the investors. "If these three factors," he stated, "are constantly kept in mind by the management, operation will be reasonably successful, unless there is something basically wrong in the rates or financial structure of the organization and the location of the property." Mr. Blackhall's opinion that convenience of service is the strongest selling point the interurban railroad can put forward when bidding for the patronage of the public. He defined convenient service as transporting people from where they are to where they wish to go, with safety and comfort, in the shortest possible space of time-but above all, at the time they wish to go. He stressed the importance of making a thorough study of the traveling habits and requirements of the people in the communities served and scheduling trains to meet their requirements in the best possible manner. "The next important thing," he said, "is to see that the trains make the time shown on the time-table."

Expanding on the second factor, employees, Mr. Black-hall stated emphatically that it is impossible for the management of a company to give the public satisfactory service without the active co-operation of the employees. He told of the training given North Shore employees in the handling of customers, and stressed particularly the developing of interest in this work by continuing the training after the preliminary work. Mr. Blackhall told also of the training given North Shore employees in selling rides. He emphasized the point that employees cannot be expected to sell the service without the necessary training to equip them for that work.

"Make your product purchasable without petty irritation and through a price plan that automatically incites voluntary use of your service" was the advice of Walter Jackson, consultant on fares and motor buses, Mt. Vernon, N. Y., for winning and holding customers. Mr. Jackson referred to "habit-creating" fares as essential, along with improved equipment and service, in attracting patrons, and cited the merits of the weekly pass that make it an effective ride promoter.

t make it an effective ride promoter.

THREE BUS SIZES MEET MOST NEEDS

In answering the question, "What size bus is best suited for city transportation?" Del A. Smith, general manager Department of Street Railways, Detroit, Mich., divided all regular bus lines into three general classifications and gave the type of bus considered best for each class of service as follows:

1. For light, feeder and shuttle service, as well as short extensions into thinly populated territory and outlying districts, the small 21-passenger bus is satisfactory because it makes possible the maximum frequency of service at the minimum cost per mile, providing no extreme peaks are encountered.

2. On secondary or medium lines which have a considerable volume of traffic with a fairly heavy peak load, the 29-passenger bus is desirable and economical because of the greater passenger appears of second of the greater passenger appears of the greater passenger

peal afforded without seriously lengthening the headway.

3. For main trunk lines and lines where the population is pyramiding or wherever extreme peak loads are encountered, the single-deck street car type bus seating 40 passengers is justified, because it has been proved that the operating cost per mile is but 50 per cent more than for the 21-passenger bus and about 25 per cent more than for the 29-passenger type, giving twice the seating capacity and room for four times as many standees as the 21-passenger unit. In short, the 40-passenger single-deck bus is preferable in service approaching mass transportation.

Mr. Smith also referred to special classes of service, such as de luxe express operation and the use of small capacity buses to replace jitneys. The paper was presented by Homer E. Libby.

The requirements of modern automatic control, as listed by B. O. Austin, control engineer Westinghouse Electric & Manufacturing Company, in his paper, are variable tractive effort, quick response to any change in the controller handle position, smooth and rapid acceleration, effective notching, ability to stop and hold the control at any point, adaptability to foot and hand operation, non-interference with safety devices, simplicity and reliability. Mr. Austin named the fundamental advantages of automatic control as variable automatic accelerating rates, maximum operating efficiency, foot control and low operating cost. Mr. Austin's paper was discussed by W. A. Clough, railway and bus equipment engineer, General Electric Company.

A golf tournament on the afternoon of the first day was the high spot of the entertainment program. At the banquet held the same evening, the entertainment was furnished by the South Shore Chorus, "Mary and Jim." popular radio artists, and a première danseuse from Chicago. Following the banquet a dance was held.



Interior of new Detroit car

Speedy Light-Weight Car Built at Detroit

Design of experimental vehicle includes extensive use of aluminum. Four high-speed 50-hp.

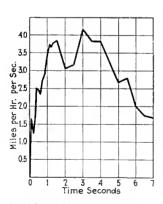
motors are mounted on Timken trucks

LIGHT WEIGHT, rapid acceleration, and high free-running speed are features of an experimental car recently built by the Department of Street Railways, Detroit. Factors which have contributed to keeping down the weight are: Light-weight motors and trucks. reduced amount of steel framing in car body, absence of heavy brake rigging, use of aluminum as the material for the trolley pole, bumpers, door engines, air compressor and piping.

Car body weight	9,280 (incl. gears	Old Car, Pounds 21,320 9,940 5,240 (incl. gears)
	32,500	36,500 lbs.

In general, the car follows the Peter Witt design now standard on this system. Four Westinghouse 300-volt 60-hp. motors are mounted on Timken model 52 trucks. General Electric 16-point automatic control is used. The following comparison shows where the reductions in weight have been made.

Preliminary tests show this equipment to produce an acceleration rate of 4.18 m.p.h.p.s. in the first three



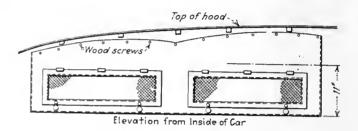
Rapid acceleration shown by tests of new Detroit car

m.p.h.p.s. in the first three seconds. The acceleration is of such a smooth character as to cause no inconvenience to the passenger, although he cannot fail to notice the speedy action of the car. The numerical value of the rate of acceleration has been determined by the use of a Cambridge recording accelerometer, and a typical acceleration curve is shown in an accompanying illustration.

The braking system is straight air but has the novel

feature of using a foot-operated brake valve of the G. E. VB-2 type. This is a balanced air pressure valve and gives an operation akin to that of braking an ordinary automobile. The pedal is spring controlled and may be locked in the application position. The air brake piping is made of dead soft aluminum tubing. The radiating coil for the air brake system is made of a finned type of pipe recently designed by the Peter Smith Heater Company. It possesses the advantage of reduced weight, less internal friction and simplified installation.

The body is of steel construction and uses U-shaped posts and carlines. Wooden post fillers are not used but aluminum post facing of a section shown in an accompanying sketch. The seating arrangement is much the same as previously used except that cross seats have been substituted for longitudinal seats in the forward section. The seats are of an individual type and are deep upholstered with cushioned backs, giving the

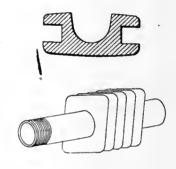


Novel devices included in design

Above: Ventilated cover for door engine allows warm air to circulate around apparatus and prevents freezing in winter.

At right: Cross-section of aluminum window post facing.

Below: Finned pipe radiating coil for braking system.



maximum of seating comfort. The upholstery is Delft blue leather which, with mahogany woodwork, makes a pleasing combination.

As a departure from customary practice on this property a single sash was substituted for the usual upper and lower sash, and as the post centers were increased from 29½ in. to 33½ in. the sash is wider, thus improving the appearance of the car. A wide bottom sash rail was used and into each was fitted an individual ventilator. Forced ventilation is used; following a design developed by the Peter Smith Heater Company. With this system air is admitted to the car through intake ventilators on the roof and exhausted through four grilles distributed in the floor. The exhaust is accomplished by means of a motor-driven exhaust fan suspended under the car floor and connected to the floor grilles by flexible metal tubing.

Reduction of unsprung weight is one of the most important of several noise reduction features that have been included in the design, others are worm gear drive, rubber spring supports, rubber motor supports; rubber mounting of air compressor and trolley base, and sound insulating of the floor with felt. The operation of the car from the noise standpoint has proved highly satisfactory.

A.I.E.E. Discusses

Railway Electrification

At the transportation session during the Swampscott convention the Mexican Railway electrification, contact wire wear and substation design were important topics

PROMINENT on the program of the summer convention of the American Institute of Electrical Engineers, held at Swampscott, Mass., June 24-28, was the subject of transportation. The committee on that subject, headed by W. M. Vandersluis, presented a report showing the progress of electrification of steam railroads during the year. Reference was made to the projects of the Pennsylvania Railroad, the Great Northern Railway, the Cleveland Union Terminal Company, the Reading Company, the Delaware, Lackawanna & Western Railroad, the Boston, Revere Beach & Lynn Railroad and the city of Rochester. These have been mentioned in this paper from time to time. Diesel-electric locomotives, rail cars, supervisory control for substations, mercury arc rectifiers and high-speed circuit breakers are also included among the developments of the year.

Four papers of interest to electric railway engineers were presented. These covered the electrification of the Mexican Railway, contact wire wear on electric railroads, an alternating-current electric railroad substation of the Pennsylvania, and the direct-current substations supplying the Illinois Central. Brief abstracts of these papers follow.

MEXICAN RAILWAY ELECTRIFICATION DISCUSSED

The paper on this subject, by J. B. Cox of the General Electric Company, gives operating results of the electrification of the Mexican Railway, Ltd., which was the first railway built in Mexico, having been opened to traffic on Jan. 1, 1873. The main line runs between Mexico City and Vera Cruz and is 264 miles long. There are six branch lines which increase the route miles to a total of 482. The most difficult portion of the line consists of 19 miles of 4.7 per cent grade between, Encinar and Boca del Monte, where the table-land is reached. In 1921, when the road was returned to its owners following five years of government operation, the property was found to be in unsatisfactory condition, with operating expenses more than doubled, thereby increasing the operating ratio from 0.51 in 1924 to 0.79 in 1920. Higher wages and new working agreements were largely responsible and continued to become more dif-The mountain division had about reached its maximum capacity with the existing equipment, making it necessary to consider improvements.

A study of the operating costs of this section was made in 1921, from which it was apparent that electrification would relieve the congestion and make it possible to more than double the capacity of the line and at the same time make a yearly saving of \$523,000 in operating expense. The electrification was estimated to cost \$2,420,000, thus indicating a return of 21 per cent on the gross investment including electric locomotives, in addition to the increased capacity and many other advantages.

Construction work was started in January, 1923, and electric operation between Orizaba and Esperenza was complete in January, 1925. The total cost for the 29-mile section was \$2,427,480. Internal disturbances delayed the work several months and reduced the traffic greatly. In March and April, 1928, the traffic became comparable with that of September and October, 1921. for which period the actual traffic records and operating costs with steam had been used as a basis for comparison with the estimated cost of an equal traffic with electric operation.

In the meantime the general results had been so satisfactory that the electrification was extended 35 miles south to Paso del Macho, making a total of 64 miles at a cost of \$3,606,937.

The system is operated with 3,000 volts direct current, supplied from a simple eatenary system with double No. 0000 trolley wire on the main line and single No. 0000 trolley in yards and passing tracks. There are two 500,000 circ.mil positive feeders and one No. 0000 negative feeder between Orizaba and Boca del Monte. Originally a single substation was installed near Maltrata, being almost in the center of the feeder circuit. This station contains two 3,000-kw., 3,000-volt, threeunit synchronous motor-generator sets for supplying power to the original 29.5-mile electrification. With the extension of the efectric zone to Paso del Macho, making the total length of route approximately 64 miles, a second substation was installed at Portrero. This contains two 1,500-kw, units which are similar, except for size, to the original equipment. Both stations are supplied with power purchased from the Puebla Tramway, Light & Power Company at 42,000 volts, 60 cycles.

The initial installation included ten locomotive units suitable for handling both passenger and freight trains. They are of the twin-geared six-motor articulated-truck type, capable of operating at a maximum speed of 40 m.p.h. and provided with equipment for regenerative electric braking. The motors are designed for 1,500 volts per commutator, two being permanently in series.

The Orizaba-Esperenza section has now been in complete operation electrically since January, 1925, and the full records for four years are available. During March and April, 1928, the traffic reached a new maximum

which was in excess of that which was attained with steam. Briefly, the ten electric locomotives handled 36 per cent more tons than were handled by more than double the number of steam locomotives in September and October, 1921, with 8 per cent less trains and 40 per cent less train-hours on the road, and at 50 per cent of the corresponding total cost of steam operation for 26 per cent less tonnage. The saving was \$67,102 for the two months, or at the rate of \$402,612 per year, which alone represents more than 15 per cent on the total gross cost of electrification. This does not represent the total saving, as labor costs had increased sharply in the meantime. When the costs were adjusted to equal traffic and equal wages, it was shown that the equivalent costs for steam service would be \$1,068,000 per annum and the electric costs \$404,652. The indicated annual saving is thus \$663,348, as compared with an estimate of \$523,029.

SECURING FLEXIBILITY IN CONTACT LINE

In his paper on contact wire wear on electric railroads, I. T. Landhy, assistant engineer Illinois Central Railroad, described the contact systems of several electrified roads. Flexibility in the contact plane is important, he held, and it can best be secured by staggering the points of support of the contact wire with respect to the messenger, while at the same time damping out the unwanted harmonic wave ahead of the pantograph by means of as high a tension in the contact wire as it will permit. Pantograph design resolves itself into a judicious composition of the following essentials: (1) Sufficient current-collecting surface; (2) lightweight moving parts: (3) sufficient uniform upward pressure; (4) freedom from friction in the bearings. Intrinsically, he said, lubrication plays an important rôle in reducing wear. On long tangents where the contact wire is in the middle of the pantograph the greater part of the time, the lubricant becomes depleted and wear is increased. On curves where the pantograph is wiped across the contact wire the wear is less, the lubricant from the ends of the pantographs being distributed over the whole surface. A comparison of contact wire measurements shows that there is approximately 30 per cent more wear on tangent track than on curves. The experience of the New Haven has been that, generally, the higher the speed the less the wear of the contact wire. The effect of contact wire wear of current collected is not so well known, but the general impression is that the greater the current the greater the wear.

Substations of the Illinois Central and Pennsylvania Described

J. V. B. Duer, electrical engineer Pennsylvania Railroad, described one of the a.c. outdoor substations supplying 11,000 volts single phase for the Philadelphia-Wilmington electrification. In this station all apparatus is in the open except the control board, which is located in a house designed for the purpose.

The railway substations for the 1,500-volt d.c. electrification of the Illinois Central were described by A. M. Garrett, engineer of substations, Commonwealth Edison Company. These substations, owned and operated by the Commonwealth Edison Company and the Public Service Company of Northern Illinois, receive the 60-cycle energy for conversion to direct current from the 12-kv. transmission system of the former and the 33-kv. system of the latter power company. Approxi-

mately 80 per cent of the conversion capacity is in synchronous converters and the remainder in mercury rectifiers. The decision to use rectifiers for a part of the load can be assigned to several reasons, principal among them being that this new type had the natural advantage which a unit with no moving parts has over one with rotating parts and wearable and friction surfaces. Other reasons included high efficiency with fluctuating loads, absence of noise and vibration, low maintenance expense, and the elimination of extensive ventilation facilities.

Discussion of the papers presented was called for en bloc by Chairman N. W. Storer, of the Westinghouse company, who presided. Prof. D. C. Jackson of Jackson & Moreland, Boston, commended Mr. Cox's paper because of the cost data included in it.

GENERAL DISCUSSION SHOWS INTEREST IN ELECTRIFICATION PROBLEMS

Sidney Withington, electrical engineer of the New Haven road, said the data presented by Mr. Cox would be more convincing if contrasts were made between the most modern steam locomotive power units and electrical equipment. The economies of superheaters, feed water heaters, etc., should be taken into account in modern comparisons. Referring to Mr. Landhy's paper, he said that it is still a question whether to lubricate the railway trolley wire or the pantograph shoe. It may be necessary to utilize some auxiliary moving part on top of the pantograph in order to cut down vibration. Chromium plated material may be useful in future pantograph design. Observation of trolley wear on the Providence-Fall River, Mass., electric branch indicates increased wear on sections of the line leaving stations, heavy accelerating currents being taken from the wire on these stretches.

C. S. Anderson, American Brass Company, pointed out that from 15 to 20 per cent less wear is being secured with cadmium-copper bronzes than with tincopper bronzes. The former do not become brittle or "hot short" when overloaded.

"hot short" when overloaded.

Major E. L. Moreland, Boston, raised the point that the use of one vs. two contact shoes on pantographs deserves more thorough study in relation to wear. Several speakers maintained that the use of two shoes insures better contact, but the cost of such practice in terms of increased wear was not definitely acknowledged. Most of the speakers preferred two shoes.

W. B. Potter, consulting engineer General Electric Company, said that the electric locomotive presents the greatest problem in railroad electrification from the cost standpoint, in many cases running between 40 and 50 per cent of the total cost of electrifying. He said further that the mercury arc rectifier will be utilized more widely in the future, perhaps being available for 5,000-volt d.c. service in time. The unidirectional characteristics of its output make it promising in electrochemical applications. The future of railroad electrification is very bright, Mr. Potter declared.

In the closing remarks by the authors, it was brought out that the use of high towers by the Pennsylvania Railroad electrification was predicated by the spacing required for 132-kv. transmission. Mr. Garrett pointed out that a good deal remains to be learned about the operation of mercury are rectifiers, including study of their interior performance, possible improvements and limitations. Results thus far obtained are good, but the subject is not a closed book.



Transmission and axle overhaul is kept separate from motor rebuilding in New Haven bus shop of the Connecticut Company

DAILY CHECK

Shows Condition

AINTENANCE of buses operated by the Connecticut Company is based on a mileage system, with the exception of painting, which takes place on an average of once every $12\frac{1}{2}$ months. In order to know exactly when a bus has traveled the required distance for motor overhauling or general unit changes, the comptroller's office keeps accurate records of the distance traveled by each vehicle. When a bus has completed the specified mileage the maintenance department is informed promptly and it is taken out of service.

Experience has convinced the management that it is a good policy to overhaul the various units at predetermined intervals. One of the first requirements in keeping a

bus constantly available is that any defect, however small, is brought immediately to the attention of the repair force. To accomplish this, the company has designed a "Motor Coach Defect Card" which is issued to each driver before he starts on his daily run. On

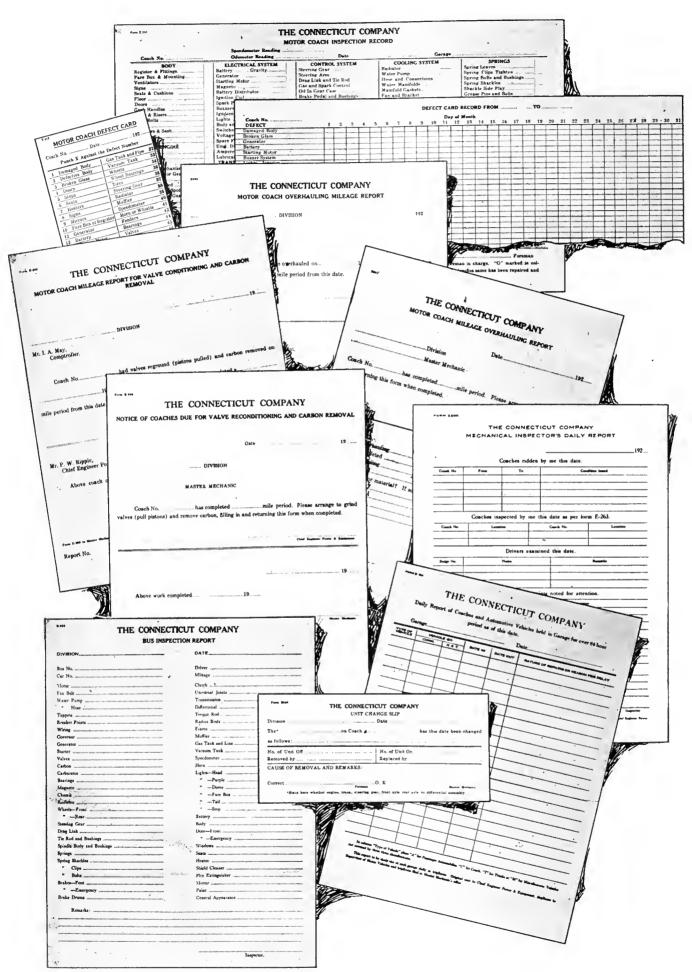
of Bus Fleet

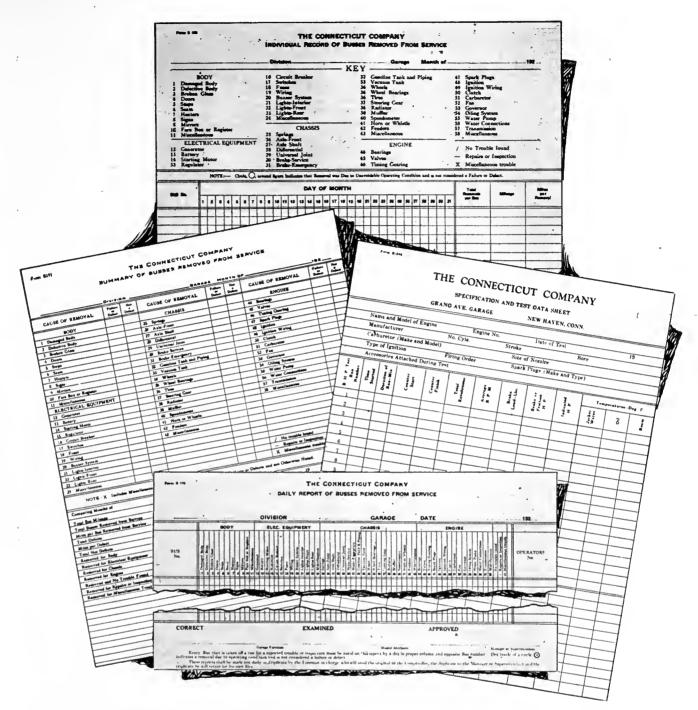
Comprehensive reports keep Connecticut Company officials well posted concerning condition of equipment. Inspection and maintenance work is done at 15 operating garages. All overhauling is done at the New Haven shop on unit replacement basis. Painting not synchronized with overhaul.

this card, the various parts of the bus are listed under fifty-seven headings. Should a defect occur the driver indicates the item by a punch mark on the card, adding any other information which he deems necessary regarding the trouble. At the end of his daily run this card is deposited in a box in the garage. It is collected by a member of the shop force who repairs the item indicated, and, at the same time, notes this fact on a "Motor Coach Inspection Record," which is kept for each bus.

When the bus has traveled 2,000 miles, this record of repairs is used as the basis for inspection. The bus is thoroughly gone over and all defects which have developed since the last 2,000 mile inspection are carefully

checked to see that the respective parts are in proper running condition. At every 2,000 mile inspection, this record is compared with the previous one to see if certain defects have recurred. In such instances this is investigated and particular care is taken that the same





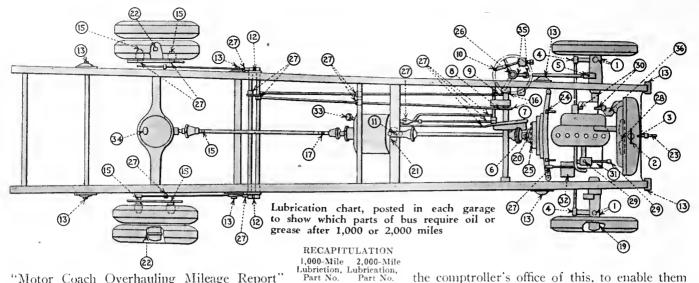
Forms used for recording information on buses removed from service, and a sample specification sheet

defect does not occur again. These records are kept for three years in order to have available at any time the written proof of the durability or weakness of the various parts of the bus.

Besides keeping the coach continually in first-class running condition by repairing all minor defects, the company recognizes the necessity of reconditioning the motor at intervals independent of the general overhaul or unit change, which takes place after every 75,000 miles of operation. Due to the different construction of the sleeve-valve motor and the poppet-valve type, the removal of carbon from these two types of engines takes place at different intervals. Best results are believed to be obtained when the cylinders are cleaned and the valves reground in the poppet-valve motor after every 10,000 miles and cylinders cleaned in sleeve valve engines every 20,000 miles.

When the earbon has been removed and the valves reground, the master mechanic notifies the maintenance department, which advises the office of the comptroller that the bus has been put in service. He also requests to be notified when that bus has traveled another 10,000 or 20,000 miles, depending on the type of motor. The report sent by the maintenance department to the comptroller's office with the information when a particular bus should be brought in for reconditioning of motor is called "Motor Coach Mileage Report for Valve Conditioning and Carbon Removal," and the notice sent by the maintenance department to the master mechanic is called "Notice of Coaches Due for Valve Reconditioning and Carbon Removal."

When a coach has traveled 75,000 miles, it is considered necessary to take it out of service for a complete unit charge, and the auditing department sends the



"Motor Coach Overhauling Mileage Report" to the maintenance department, advising that a bus has traveled the specified distance. The maintenance department then notifies the master mechanic in whose division the bus operates and instructs him to take this vehicle out of service and send it to the central repair shop in New Haven.

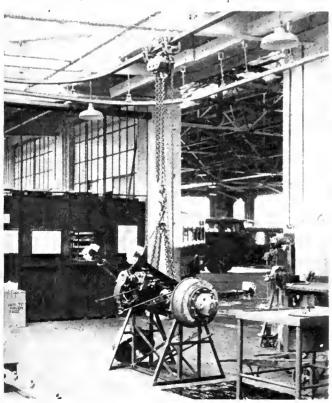
All necessary repairs are made there, while anything which has been brought to the attention of the division repair force at the 2,000 mile inspections is again carefully gone over to insure that recurrence will not take place. All units such as steering gear, motors, front axle, rear axle, transmission and differential are removed from the bus and replaced by recondi-

tioned units from the storeroom. By following this method, the time out of service is reduced to a minimum. When the bus is finally O.K. for service, it is sent back to its division, and the maintenance department informs

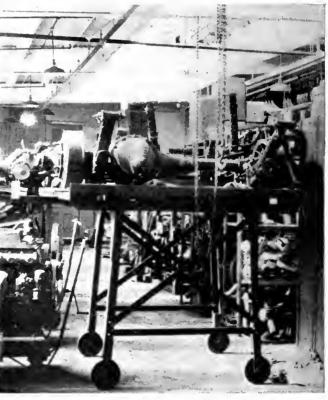
the comptroller's office of this, to enable them to keep a record and to advise the chief engineer of power and equipment when the bus should again be taken out for a reconditioning of motor or an annual overhaul. The maintenance department keeps a record of any unit change which takes place and a so-called "Unit Change Slip" is filled out by the foreman in whose shop the change takes place, giving all the information required. In this manner, a careful check is obtained on the performance of all units in operation on the entire fleet.

In order to keep fully posted on the efficiency of the various division repair shops, the company has a number of so-called "floating inspectors" who ride the buses and bring any

irregularity to the attention of the master mechanic responsible, while a copy of their daily findings is sent to the main office. Besides filling out this so-called "Mechanical Inspectors' Daily Report," they make



Rear axle completely overhauled and ready to be taken to storeroom



Motor and axle assemblies are stored on specially designed carriages with the motor under the axle

a report on each bus they ride, noting the defects observed and the action taken. Independent of the maintenance department, the chief engineer of power and equipment is informed daily by the transportation department which coaches have been held in the garage for more than 24 hours.

A report is received daily of the total number of buses removed from service and an individual record is kept also of buses removed thus indicating weak points in the upkeep of the rolling stock. A list of all buses removed from service is kept for each month, and the

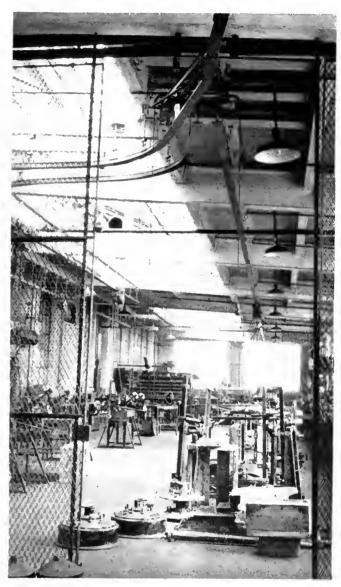
Completely overhauled motor, tested on the dynamometer and ready for installation in a bus

chief engineer can thus determine immediately why the buses are kept out of service and detect any laxity or inefficiency in maintenance work.

The units changed after the completion of every 75,000 miles are thoroughly overhauled and parts which require repair are replaced by those which have been reconditioned or are new, so that the bus will be available again in the shortest possible time. Replacement units are kept always available in the central repair shop storeroom. These include engines, transmissions, steering gears, front axles, rear axles and differential assemblies. Should an emergency call come in from one of the divisions for a replacement unit prior to the 75,000

mile overhaul, it can be shipped immediately and the damaged unit sent to the repair shop where it is overhauled and put into the storeroom. Before an engine is again O.K.'d for service and placed in the storeroom, a thorough test is made on the dynamometer.

The layout of the shop is such that the least possible time is required for the conveyance of units from the buses to the various places in the shop where the units are to be repaired. A monorail hoist system beginning at the platforms where the buses are overhauled, conveys the units taken out to the repair bays and through



Monorail hoist system takes units from stockroom to the place where repair work is done

a switch system. The unit can be brought either to the left or the right side of the repair shop for repairs .

Painting of the buses is done entirely independent of the central repair shop. In the territory where the buses operate there are in all five paint shops. In New Haven this takes place in the paint shop of the carbouse. A bus is given one to three coats of paint depending on its condition and dried in a specially designed electrically heated shed, described in the April 28, 1928, issue of the Electric Rahlway Journal. By this means it is possible to turn out a completely repainted job in three days, thus reducing considerably the time required for this kind of work, which formerly was about six days.

Cleveland Railway Wins Company in Maintenance

of the four departmental certificates of merit, the individual cash prize of \$200, and three of the quarterly prizes go to Cleveland. Other awards made to the Cincinnati Street Railway and the San Diego Electric Railway

NAR outdistancing all competitors, the Cleveland Railway was pronounced by the judges to be the winner of the company prize in ELECTRIC RAILWAY JOURNAL'S Maintenance Contest for the year ended July 15, 1929. The prize, a handsome bronze and silver plaque, is presented to the company which has contributed most to the advancement of maintenance practice through participation in this contest. Not only did representa-tives of the Cleveland Railway win the company trophy, but also a majority of the departmental awards for the year, and the individual cash prize of \$200. The interest felt in this contest by all the various departments is shown by the fact that the quarterly prize in the way and structures department was awarded to a Cleveland man at the end of each of the three threemonth periods.

In the bus and garage department, two quarterly prizes went to Cleveland, as did two prizes in the electrical and line department. No other company won more than one quarterly prize except the San Diego Electric Railway, which was awarded a prize in the bus and garage department for the first period, and a prize in the rolling stock and shops department for the second period. This company was the winner

Company prize for year, three of the certificate of merit in the rolling stock and shops department. In the other three departments, the certificates of merit went to Cleveland.

> After careful consideration of almost 200 articles submitted in the contest, the committee unanimously agreed on the award of the cash prize of \$200 to Joseph Croyle, for his article "One Man Tie Nipper," published in the April issue of the JOURNAL. A close competitor for this prize was the article "Efficient Methods Developed for Stringing Trolley Wires" by Angus G. Scott, assistant superintendent of overhead lines of Cleveland, which received honorable mention by the committee. Both of these articles are the result of the experiences of the writers in the maintenance work of the track and overhead line departments, and show clearly the valuable results that can be accomplished by men who do not merely follow routine methods, but try to improve the quality of the work done and to save the company expense.

> How Cleveland Won the Company TROPHY

> WHEN the Maintenance Contest was started this year, the president of the Cleveland Railway, J. H. Alexander, sent out a letter to all department heads calling their attention to the terms of the contest and the desirability of making a special effort to not only win as many individual prizes as possible, but to earn the trophy for the company as well. The

interest in the contest was further stimulated by discussion of the subject at meetings of the company's contact club, comprising executives, depart-ment heads and junior department heads, which meetings are held at irregular intervals for the purpose of keeping the organization familiar with company policies and at which time speakers discuss subjects of common interest.

That the result has more than justified the effort is well evidenced by the fact that the company was awarded seven prizes out of a possible twelve in the three groups of the contest; that it received three out of a possible four departmental certificates; that it earned the individual cash prize and honorable mention for the entire year's contest and was awarded the company trophy. The result emphasizes the esprit de corps which exists in the Cleveland Railway's organization and shows clearly what can be accomplished when an organization works whole-heartedly as a unit behind its executive head.

PRIZES AWARDED FOR THIRD QUARTERLY PERIOD

PRIZE winners in each of the four departments for the three-month period ended July 15 were selected at the same time. In the department of rolling stock and shops the award was made to E. J. Jonas, superintendent of equipment Cincinnati Street Railway, for his article "Car Body Turn-

Comparison of Number of Articles Submitted by Various Companies

Name of Company	Rolling Stock and Shops	Way and Structures	Electrical and Line	Euses and Garages	Total
Cleveland Railway Virginia Electric & Power Company	17	16	22	12	67 28
San Dicgo Electric Railway Other companies	13	Ĭ 15	i 7	4 3	19 81
Total submitted in contest		40	31	27	195

Prize-Winning Articles in Maintenance Contest

Prize-Winning Articles in Maintenance Contest				ay .
Name of Author and Company	Title of Article	Department	Group Number	Date Published
F. E. Davidson, Clevcland Railway. Joseph Croyle, Cleveland Railway. A. G. McIotosh, Cleveland Railway. Leonard S. Rose, Cleveland Railway. Leonard S. Rose, Cleveland Railway. Leonard S. Rose, Cleveland Railway. Angus G. Scott, Cleveland Railway. Angus G. Scott, Cleveland Railway. L. H. McAdsm, Toronto Transportation Commission. Charles Herms, San Diego Electric Railway. Arthur E. Clegg, San Diego Electric Railway. Harvey L. Bullock, New York Central Railroad. E. J. Jonas, Cincinnati Street Railway.	Automatic Drain Valve	Electrical and line Bus and garage Rolling stock and shops	I II III III III III III III III	February 9, 1929 April, 1929 August, 1929 June, 1929 August, 1929 June, 1929 August, 1929 December 15, 1928 January 19, 1929 April, 1929 November 17, 1928 August, 1929

Trophy and Other Awards
Contest

over Truck." A. G. McIntosh, superintendent of track Cleveland Railway, was awarded the prize in the department of way and structures for his article, "Safety Ground Device for Electric Equipment." In the electrical and line department, the prize went to Angus G. Scott for his article, "Efficient Method Developed for Stringing Trolley Wires." Leonard S. Rose was awarded the prize in the bus and garage department for his article, "Pit Jack for Removing Bus Transmission Units." All of these articles are published on the following pages in this issue.

Emil John Jonas

BORN in Cincinnati, Mr. Jonas was thrown on his own resources at an early age, and had to provide for his own living as well as his education. The latter was made possible by attending the night classes of the Ohio Mechanics Institute for several years. At an early age he was attracted to transportation, especially in connection with the slow-moving cable cars on which he sold newspapers. he gained a vast amount of practical experience at Chester Park during a year with the St. Louis Street Railway as chief electrician, he went back to the Cincinnati, Georgetown & Portsmouth Railroad as superintendent of power and roadways at the time of its electrification. During his twenty years of service in various capacities with the interurban lines, much pioneering work was done in developing a demand for domestic and industrial electric service in Clermont and Brown Counties. Seeking a larger field, he joined the ranks of the then Cincinnati Traction Company in 1922.

When operation of this system was taken over in 1925 by the Cincinnati Street Railway, Emil John Jonas was assigned to



Emil John Jonas



Joseph Croyle

(In Oval) Angus G. Scott

Leonard S. Rose

A Worthy Trio of the Cleveland Railway

HE individual cash prize of \$200 for the best single item submitted in the maintenance contest was awarded to Joseph Croyle, track foreman Cleveland Railway, for his article "One-Man Tie Nippers," published in the April issue, page 550. An article giving a description of Mr. Croyle's career appeared on page 673 of the June issue.

The departmental prize in the third period of the Maintenance Contest for the electrical and line department was awarded to Angus G. Scott, assistant superintendent of overhead lines, for his article entitled "Efficient Method Developed for Stringing Trolley Wire." An article describing the career of Mr. Scott will be found in the June issue, page 673.

In the bus and garage department the prize of the third period of the contest went to Leonard S. Rose, assistant superintendent motor coach department Cleveland Railway, for his article "Pit Jack for Removing Bus Transmission Units." A biography of Mr. Rose will be found on page 673 of the June issue.

the position of superintendent in charge of rolling stock and shops. His most notable achievement in this capacity was the designing and equipping of the new Winston car shop, which has been accredited by prominent equipment men as being the last word in shop design.

Andrew G. McIntosh

ARRIVING in this country from Scotland in April, 1913, Andrew McIntosh started immediately to work for the Cleveland Railway as welder and on the maintenance of equipment. From 1917 to 1919 he was foreman in charge of welding and burning for the American Ship Building Company in Cleveland, and from 1919 to 1921 Mr. McIntosh was foreman in charge of electric welding for the American Steel & Wire Company. Returning again in 1921 to the Cleveland Railway he became equipment foreman of the way department. He has charge of all electric and thermit welding, burning, spot welding and grinding; also, the maintenance and operation

of equipment, such as concrete mixers, concrete breakers, tampers, plows, rollers, sand-drying and sand-blasting machinery, etc., are under his supervision.



Andrew G. McIntosh

ELECTRIC RAILWAY JOURNAL—August, 1929

These Items Won Prizes in

Safety Ground Device for Electric Equipment*

By A. G. McIntosh Superintendent of Track Equipment, Way Department, Cleveland Railway

EXTENSIVE use of electricallyoperated equipment on track work of all descriptions emphasizes the need for a safe grounding device. A new type of safety ground has been designed and used successfully



Safety of trackmen is promoted by use of this grounding device

by the Cleveland Railway. It consists of a wrought-iron plate as a contact shoe to which is fastened a 3-in. fiber top, somewhat larger over all than the iron shoe, for protection from the latter. The handle is made of fiber and all screws are countersunk and the holes filled with sealing pitch. A 12-in, length of lead wire passes through the fiber top and is a full reel of trolley wire is mounted fastened to the iron contact shoe, term nating in a connecting plug. The wire leading from the machine

being operated is equipped with a A shaft to which two pulleys of receptacle into which this connecting plug is inserted, so that the contact shoe may be changed from one machine to another without disconnecting the wire from the machine. This ground can be used on either T or grooved girder rail, and can be made in any machine shop at a very small cost. It can be handled in any kind of weather with perfect safety.

Efficient Method Developed for Stringing Trolley Wire*

By Angus C. Scott Assistant Superintendent of Overhead Lines, Cleveland Railway

OR several years a special trolley wire stringing truck has been in service on the lines of the Cleveland Railway. This truck permits the stringing out of the new wire at the tension desired and the taking down of the old wire in one operation. Formerly it was necessary to string out the new wire, attach the fixtures to it, and then either cut down the old wire in sections or reel it up. The cutting down of the old wire and reeling it up in the street is a hazardous operation at any time of the day or night. In stringing out the new wire, it was formerly necessary to pull the wire to the approximate tension desired about every thousand feet. This operation is now only necessary about every one-half mile.

With the new stringing equipment, on an arbor on the rear of the truck.

*Submitted in Electric Railway Jour-NAL Prize Contest.

pressed paper are attached secures the reel to the arbor. Brake bands lined with regulation automobile brake lining are then installed over the pulleys, and attached to a common crossbar by means of turnhuckles. When pressure is applied to the crossbar by means of a wing nut equal pressure is applied to both pulleys, and the tension at which it is desired to string the trolley wire is secured. The new wire is led over the top of the reel and spliced into the line. The old wire is led into the front of the truck through an opening equipped with rollers and secured to an empty reel. This reel is turned by means of hand labor, four men being required. While it would be possible to make this operation mechanical, it is felt that the initial expense would be too great to justify so doing.

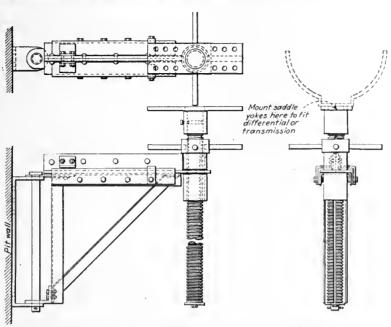
To facilitate loading and unloading the reels, an overhead chainfall has been installed on a runway inside the truck. The truck is well equipped with lights for night stringing. The truck has been equipped with a winch and collapsible derrick which permits of its usage for other work than just wire stringing.

In actual usage, a line truck precedes the stringing outfit and removes the old wire. Behind the reel truck another line truck ties the new wire to the span wires. They also install about every fourth feed-in ear for safety. Another truck follows the stringing crew and clinches the ears and aligns the trolley wire. When a car approaches the stringing crew the three trucks pull off to the side, close



Use of this double-reel truck has facilitated the process of stringing trolley wire at Cleveland

the Last Contest Period



Specially designed pit jack facilitates removal of bus transmission units in shops of Cleveland Railway

up, and the car coasts by. By this place the jack in either of these two method a mile of wire may be taken down and new wire completely installed on hangers in $2\frac{1}{4}$ hours.

By this place the jack in either of these two positions by simply removing the unit in the desired location. With two

This method of wire stringing and the operation of the truck have both proved economical. One foreman can control the whole operation, there is very little vibration in the overhead due to the fine performance of the reel brake, and the wire may be restrung and taken down in a minimum of time.

Pit Jack for Removing Bus Transmission Units*

By Leonard Rose
Assistant Superintendent Motor Coach
Department, Cleveland Railway

PIT jacks, suitable for use in installing or removing transmissions or differential carriers, are almost a necessity in a motor coach overhaul shop having any amount of this kind of repair work to do. The pit jack developed for this purpose by the Cleveland Railway is mounted on the pit wall by means of a hinge pin and wall bracket. By mounting one wall bracket at the front-center of the repair pit, just under the location of the transmission, and another at the rear of the pit at about the location of the rear axle, it is possible to

place the jack in either of these two positions by simply removing the hinge pin and reassembling the unit in the desired location. With two brackets located in this manner it is possible to handle all of this kind of work in one pit. Since the brackets are neither bulky nor cumbersome, any number may be mounted along the pit wall at strategic points, to take units of various makes of coaches and different wheelbases.

In operation, yokes or a properly shaped saddle to fit the unit to be removed are mounted on the jack head. The jack is then raised into place, the unit dismounted and the jack lowered. By swinging it around to the pit wall, the unit may be rolled off onto the floor and a replacement rolled on to the jack.

While a jack of this kind is not essential on some equipment, it is almost a necessity on others. The

installation of one similar to that shown in an accompanying illustration eliminates much of the difficulty encountered in handling heavy units under the coach, permits faster and more efficient work, and removes an accident hazard of no small importance.

Car Body Turn-Over Truck*

By E. J. Jonas Superintendent of Equipment Cincinnati Street Railway

WORK on the underside of car bodies is made easier by means of a combination shift truck and car body turn-over device designed and built in the shops of the Cincinnati Street Railway.

All bearings are anti-friction, which makes it possible for four men to push a car body off or on the transfer table, while two men on chain blocks can turn the body over to an angle of 90 deg. to permit work on the roof if desirable.

The greater efficiency with which the men can perform their work—such as cleaning, painting, cable work, and piping on the underside of cars—has resulted in a saving of 25 per cent in time. Additional trucks are to be built and used as shift trucks with the idea that any car body undergoing repairs can be rolled over.







Trucks designed to permit turning over of car bodies in the shops of the Cincinnati Street Railway

^{*}Submitted in Electric Railway Jour-NAL Maintenance Contest.

Armature Tests and Testing Equipment Surveyed

By R. S. Beers
Railway Engineering Department General Electric Company,
Schenectady, N. Y.

ARMATURE testing equipment in railway repair shops varies from a minimum of a bank of lamps and a careful, skillful workman to a maximum of a complete testing laboratory where each rewound armature is given a stand test at full load. The minimum testing equipment seems inadequate, and the expense of the maximum seems unjustified. In an effort to strike a happy medium, a survey of the tests used by 30 representative electric railways throughout the United States has been made.

It was found that the tests commonly used when rewinding armatures include: (1) Bar to bar test of commutator; (2) high-potential test of commutator; (3) position of armature coil leads; (4) high-potential test of coils; (5) short and open-circuited coils; (6) high-potential test of complete armature, and (7) running test. Tests 5, 6 and 7 should be applied to overhauled armatures.

The bar-to-bar test of the commutator is a high-potential test to insure good insulation between adjacent bars. The customary method is to use a lamp or lamps in series with the testing terminals. Some operators use trolley voltage on new commutators, while the majority use 110 to 125 volts. This latter seems too low, and the trolley voltage too high for an old commutator. It would appear that a voltage of 200 to 250 would be better. This can be obtained readily by connecting lamps across the trolley, as shown in an accompanying sketch.

The high-potential test of the commutator is to make sure of good insulation between the commutator bars and the shell. A piece of bare wire is wound around the bars, connecting them together. High potential is applied between shell and bars. Between 2,000 and 3,000 volts should be used. To check the position of armature leads, each armature coil is rung out to insure that there are no connections between adjacent coils, and further to make sure the coil leads come out of the coil in correct order. The high-potential test of coils is made with the coils in place in the armature, bottom leads in place but top leads not connected. A wire is wrapped around the

commutator, as in test No. 4. Its purpose is to locate any coils that may have been injured when they were put in the armature slots. Between 2,000 and 3,000 volts should be used.

The test for short or open-circuited coils should be made first when all coils and coil leads are in place and before soldering. It should be repeated after

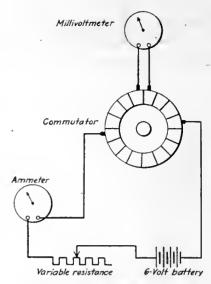
uld be repeated after
the armature is
completed and the
commutator turned
and slotted. Either
a transformer
(armature growler)
or a millivoltmeter
may be used. When
applied to overhauled armatures
the millivoltmeter

pose is to locate have been injured in the armature s and 3,000 volts s. The test for sh coils should be ma and coil leads are soldering. It sho

Method of connecting lamps in a 600volt circuit to obtain 200 to 250 volts

will locate broken and partly broken armature leads much better than any other method.

A final high-potential test of the complete armature should be made when the final bindings are in place. A voltage of 2,000 to 3,000 should be used on rewound armatures. and 1.000 to 1,300 volts on overhauled armatures. After the armature is installed in the motor frame, a short run full speed and load, or a run light at full speed, is very desirable. It tests the bearings and electrical connections a way none of the other tests does.



Connections for making a bar-to-bar test with a millivoltmeter

The current lead should be located on the commutator so as to obtain a midscale reading of the millivoltmeter. The current should be from 6 to 10 amp. When the current value is determined it should be held constant by means of the variable resistance. The voltmeter will show the same reading between each pair of bars if the coils are right. A broken lead gives a higher reading and a shorted coil a lower reading.

The survey shows some railways believe that any potential test higher than trolley voltage spoils good apparatus. Their idea of testing is to locate existing faults. Those who apply a test voltage higher than trolley voltage believe a test should locate incipient faults as well as existing ones. The latter method is obviously the correct one and is used by the majority, although individual cases can be selected to show the former equally successful.

While high-potential tests vary from trolley voltage to as high as 3,000 for 600-volt armatures and motors, whether old or new, the majority of railways make a distinction between rewound and repaired or overhauled armatures. For the former 2,000 to 2,400 volts, and for the latter 1,000 to 1,300 volts, is the usual practice. The equipment for high-potential testing may be very simple and cheap if one is satisfied with two definite voltages, such as ten and twenty times the local lighting circuit voltages. Where it is desired to vary the test voltage by small increments over a range from 800 or 1,000 volts to 4,000 or 5,000 volts, high-potential testing equipment is required.

Transformer or "growler" testing for short or open circuits in armature coils provides a quick means of locating these defects. It does not indicate partial short or open circuits as effectively as a millivoltmeter. For this reason a millivoltmeter should be used for the final testing for open and short circuits in armatures. The millivoltmeter test of armatures for open and short circuits is the most successful test available for this purpose. When properly made, it will detect cracked and partly broken armature leads, as well as partly shorted armature coils, with more certainty than any other test.

Since this test is but a comparison of resistance values, it is obvious that the current should be held constant. This is best accomplished with a 6-volt storage battery, ammeter and a variable resistance. The customary practice of using trolley current through a bank of lamps, without an ammeter, for this purpose does not insure a sufficiently constant current flow for best results.

Devices and Practices Found Useful in Expediting

MAINTENANCE WORK



Hand tool for the removal of mica slivers from commutator slots

Undercutting Railway Motor Commutator Mica

By P. A. Pontius Renewal Parts Engineer Westinghouse Electric & Manufacturing Company

ICA between commutator bars MICA between comments surface on the brush wearing surface ot commutators should be undercut to insure good contact between the carbon brushes and copper bars. It is desirable that all mica and mica slivers be removed $\frac{3}{64}$ in. to $\frac{5}{64}$ in. below the wearing surface of the copper bars. An undercutting machine should be used which holds both the armature and undercutting saw in their proper relative positions. The accompanying illustration shows a hand tool for removing the remaining mica slivers after the undercutting operation.

The undercutting saws should be equal to or about 0.003 in. thicker than the thickness of the mica segments. If the bearings in which the arbor for the saw runs are in good condition and the arbor rigidly supported, a saw 0.003 in. thicker than the thickness of the mica should be used. With a shaky arbor and worn

Time and labor saving devices used in electric railway shops and garages.

bearings the thickness of the saw should be equal to the thickness of the mica. However, the saw should remove a small amount of copper along with the mica. A saw with twenty teeth regardless of diameter has given the most satisfactory performance. The outside diameter of the saw should be $\frac{3}{4}$ in. to $1\frac{1}{4}$ in., considering that the larger the diameter the more rigid should be the support of the saw carrying arbor. The diameter should be small, otherwise the saw cuts into the commutator neck.

The best cutting speed is approximately 2,000 r.p.m. The saw should be made of high-speed steel. Carbon steel dulls quickly and does not produce a clean cut slot.

Armature Dipping Tank With Underground Reservoir*

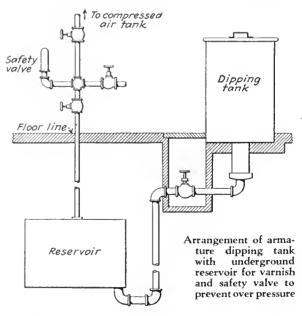
By D. D. WENDEL Street Railway Engineer Alaboma Power Company, Montgomery, Ala.

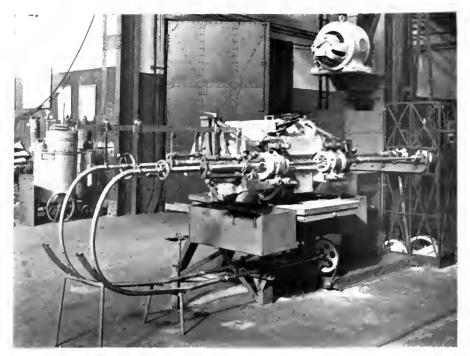
AT THE Montgomery carbouse of prevents evaporation, while a safety the Alabama Power Company valve set to pop at 15 lb. prevents designed and put into service.

piece of 6-in. pipe. This is connected with a $1\frac{1}{2}$ in. pipe to the bottom of a similar tank buried several feet in the ground. The latter acts as a reservoir for the varnish which is brought to the dipping tank under air pressure. The section of 6-in. pipe acts as a well for the armature shaft. In the bottom of this well, a strainer is provided to keep foreign matter from entering the reservoir in the ground. A valve in the pipe line

*Submitted in Electric RAILWAY JOURNAL Prize

an armature dipping tank with an un- over-pressure. A vent valve releases derground reservoir has recently been air from the reservoir and allows the varnish to flow back after it has been This apparatus consists of a used. Special precautions have been standard 55-gal. steel drum in the taken to insure that the air furnished to bottom of which is welded a short the reservoir is free from water and oil.





Simultaneous boring of motor and axle bearings is accomplished with this machine by the elevated railways in Hamburg, Germany

Boring Machine for Armature and Axle Bearings*

By A. Hansmann Shop Foreman Hamburg Elevated Railway, Hamburg, Germany

AHANDY machine for boring armature and axle bearings simultaneously is in use at the main repair shop of the Hamburg Elevated Railway. All the motors on which this apparatus is used are of the same type. The boring tool has two definitely and unchangeably located arbors, one for the armature bearings and one for the axle bearings. These arbors are bolted against the machined surfaces of the motor cases and thus brought accurately in line.

Each of these two arbors carries two cutters that can be adjusted within .0004 in. shaft clearance. The arbors are driven from a jack shaft over extension couplings with universal ball joints. Mechanical connection with the driving motor is made by means of a clutch, operated remotely with a pull rope at the operator's stand. The feed of the cutters is automatic through a flexible shaft.

When these bearings were bored individually, the method formerly employed, their centers did not line-up, due to variations in the bearing bushing and inaccuracies of the set-up. To insure an accurate line-up so that both bearings fitted the shafts properly,

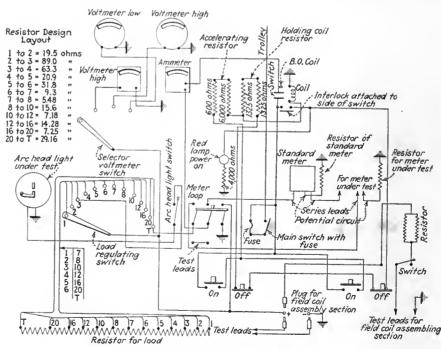
*Submitted in Electric Railway Jour-NAL Prize Contest. subsequent filing and lapping were required. Too much play in the bearings resulted in a considerable loss of lubricating oil, and a reduction of the maximum life of such bearings to about 37,500 miles. With the present method of boring, a life of 75,000 to 93,750 miles is easily obtained. The savings resulted from this new method are primarily the 100 per cent longer life of the bearings, the reduced loss of oil, the small number of hot-boxes and the greater ease with which the two bearings are simultaneously bored.

Equipment Test Board Proves Time Saver*

By Arthur E. Clegg Foreman Electrical Department San Diego Electric Railway, San Diego. Cal.

ELECTRICAL apparatus used on cars is tested on a special board in the shops of the San Diego Electric Railway. The right-hand side is devoted to testing Economy meters. An element removed from an Economy meter is used as a standard rotating meter. This has been placed in a glass case to keep out dirt and to maintain its accuracy. resistor of the potential circuit of the standard meter is mounted on the back of the board. The meter to be tested, together with its element, is mounted next to the rotating standard meter. A rack is provided in the upper right-hand corner of the board on which elements are placed for cleaning and repairing.

By throwing the circuit switch to its upper position, which is marked "meter loop," and with the regulating load switch set for the desired load on the ammeter, the meter is connected in circuit. With the switch thrown to the down position, which is marked "test leads," connection is made to place the leads in circuit. Additional tests can be made by pulling out the test lead marked with a plus sign and inserting the test lead which goes to the motor frame field coil assembling section. Other tests are performed by the aid of the load-regulating and



Connections for equipment test board

selector-voltmeter switches. Power is switched on or off the testing board by means of a push-button station located at the board and in the motor frame field coil assembling section. These push-buttons operate magnetictype switches. It has been found convenient to use the trolley voltage without resistance at the test lead. By removing a stop marked T, the regulating load switch arm comes in contact with the trolley button and gives line voltage. Arc headlights are tested by setting the load-regulating switch to give the desired voltage at the arc and then by closing the arc headlight switch and switching power on and off by means of the push-button station. The testing board has proved a great time and labor saver as it enables testing operations to be performed quickly.

Auxiliary Tire Inflater

By Del A. Smith General Manager Department of Street Railways, Detroit, Mich.

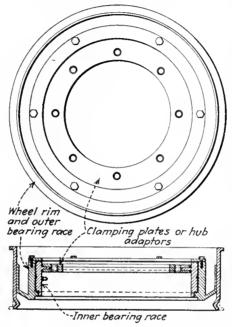
ARAGES of the Department of Street Railways in Detroit have long felt the need of a portable inflater which could be taken to any place whenever tires need to be inflated. To this end a truck was constructed on which was placed a 21-cu.ft. air tank built for a pressure of 300 lb.. On top of this a smaller tank was placed designed for a pressure of 140 lb., and connected to the larger tank through a reducer valve. An air gage with two indicators showing the pressure in both tanks at all times was installed in the line. Air at 300 lb. pressure in the large tank is obtained from the adjacent carhouse, which carries high-pressure lines.

Dummy Wheels for Towing in Disabled Buses*

By Hoy Stevens

Assistant Superintendent of Maintenance Cleveland Railway, Cleveland, Ohio

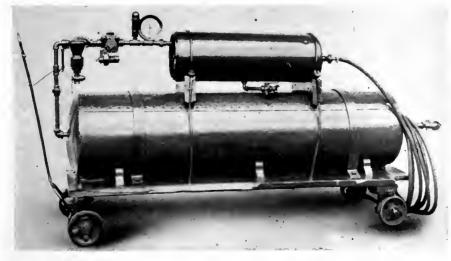
THE necessity of removing from the road quickly and economically a coach equipped with a semi-floating axle, which had suffered a differential failure, led to the development of



Dummy wheel used by the Cleveland Railway in towing disabled buses off the road

dummy wheels by the Cleveland Railway. When such a failure occurs, any attempt to drag the vehicle often results in serious damage to the gears, bearings, the spider or even the housing itself. It is not always possible to lift the rear end of a bus, and

*Submitted in the Electric Railway Journal Prize Contest.



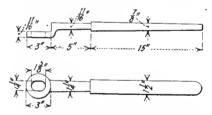
Light-weight portable tire inflater recently constructed by the Department of Street Railways in Detroit

for long hauls the so-called "towing dollies" are clumsy, and often useless. These considerations, coupled with a desire to get the coach off the road, and our practice of performing all repair work in the garage whenever possible, caused us to develop this spare set of wheels.

Essentially, these wheels are designed with integral bearings so that they can be bolted onto the hubs in place of the regular wheels. The service brakes are then locked and the coach towed in the customary manner. Of course, a spacing towbar must be used, because there are no brakes on the coach. When the front wheels are brake-equipped, the cylinders or cams must be disconnected. As may be seen from the illustration, the tire is mounted on a part of a standard wheel which has had the stud holes cut away and then welded to a large steel "bearing" ring which forms the outer race of the bearing. The inner bearing is a bronze easting, grooved for grease, and welded to a small flange. Various sets of adaptors are used to clamp on this flange and fasten it to the various hubs of different types of coaches.

Air Compressor Commutator Nut Wrench

LOSS of time, destruction of material and an increase in expense resulted in the shop of the Richmond Railways, Staten Island, N. Y., due



This wrench has simplified the maintenance work of compressors

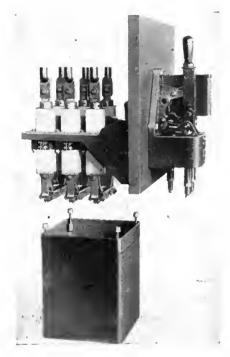
to the practice of removing commutator nuts of Westinghouse D.H. 16 air compressors with improper tools.

The wrench shown in the accompanying sketch was designed and constructed to eliminate this expense and simplify removal. The handle is made from $\frac{7}{8}$ -in. $\times 1\frac{1}{2}$ -in. stock, whereas the head stock is 3 in. $\times \frac{1}{16}$ in. The overall length of the wrench is 23 in. The handle is provided with a $\frac{3}{4}$ -in. offset and is $\frac{1}{16}$ in. thick and $1\frac{1}{4}$ in. wide for a distance of 5 in. from the head stock. The remaining 15 in. of the handle is $\frac{7}{8}$ in. thick $\times 1\frac{1}{2}$ in wide. The head is designed with an oval slot $1\frac{1}{4}$ in. $\times 1\frac{5}{8}$ in.

New Oil Switch

A NEW type of oil switch made in capacities from 200 to 2,000 amp., from 2.500 to 15,000 volts and with interrupting capacity from 20,000 to 40,000 kva. is announced by the Roller-Smith Company, New York City. The switches are made as two-pole and three-pole devices, automatic and non-automatic, single and double throw for switchboard, wall and cell mounting. They are also made for hand operation, normal and remote control, and electrical operation.

A few of the outstanding character-



This new oil switch has a continuous laminated conductor

istics claimed for this new line of oil switches are, first, continuous laminated conductor from terminal to moving member; second, self-aligning contact of drawn copper gives a strong, highly conductive, lightmoving, high-speed member; third, arcing tips are of large volume of copper and are designed especially to utilize electromagnetic stresses to increase contact pressures; fourth, the entire mechanism is completely in-

New Products

closed and is the straight-line type; fifth, conductors are rigidly clamped in heavy wet process porcelain insulators; sixth, the frame is a heavy casting, internally ribbed and domeshaped for strength; seventh, the heavy welded tank is supported on a frame by large short bolts; eighth, a double flange for the tank seat permits free venting between tank and frame, with great reduction in tendency to oil throw; ninth, the wooden contact rod is of specially treated material in one piece; tenth, the tank is lined with insulation material especially selected to resist the burning of the arc; eleventh, the volumes for oil and gas expansion are exceptionally large.

Heavy-Duty Swing Grinder

SIMPLICITY of design and ruggedness of construction are features of a new heavy-duty swing grinder recently put on this market by the Kinney Iron Works, Los Angeles, Cal. The motor is connected directly to the wheel through a flexible coupling and heavy shaft. Both ends of the shaft are mounted in heavy, dust-sealed ball bearings, while the motor also has ball bearings which are dust-proof. One of the important features of this new frame grinder is the absence of gears and the resultant wear. Another advantage is the continual observation of the work by the operator which is made possible by the position of the wheel which runs at right angles to the frame. The grinder is suspended by a sliding collar which permits a perfect balance as the wheel wears, and which facilitates suspension from any available hoist or chain block. Considerable flexibility is afforded by this coupling.



New swing grinder designed for heavy duty

Electric Hand Saw

ELECTRIC hand saws which will cross cut and rip lumber up to $3\frac{1}{2}$ in. thickness were recently put on the market by Black & Decker Manufacturing Company. They will be sold in three sizes, 6-in., 8-in. and 10-in. — these sizes designating the diameter of the circular saw that each will accommodate. They can be used also with a special metal cutting saw for cutting light gage metal or with an abrasive disk for cutting slate, marble, tile, porcelain, etc.

The saw blades are inclosed in



Electric hand saw with telescopic guards

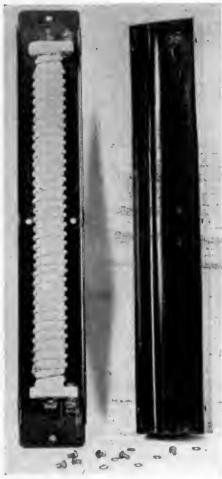
telescopic guards so that as the saw progresses in the work the guard automatically telescopes and when the eut is finished the guard snaps back, entirely covering the saw blade. The saw is arranged with an adjustable shoe which can be set to cut at any depth up to the capacity of the saw for cutting rabbets, etc. The shoe is adjustable also for cutting at any angle up to 45 deg. for mitering or for the jointing of long edges. It maintains the angle throughout the entire length of the cut, which is difficult, if not impossible, on a very long cut with an ordinary hand saw. The shoe is notched to make it easy to follow a pencil line on the work. These saws are provided with Universal motors, which will operate on direct or alternating current. They are shipped in substantial carrying cases as a convenience for men who take them out on the job.

They are very light in weight and the "pistol grip and trigger switch" affords ease in handling and controlling. The saws are equipped with full ball-bearing with chrome nickel gears and shafts throughout. They are air cooled and will operate continuously without overheating. Gears

for the Railways' Use

run in grease in grease-tight compartment. Standard equipment consists of: one rip and one cross-cut saw; one adjustable saw fence; threeconductor cable with attachment plug (one wire for grounding); and substantial carrying case.

Sill Heater Prevents Ice Forming On Window



New electric window sill heater

ICE on windows is a serious menace to safe car operation and which often requires the motorman to stop his car and clean the window. To prevent this formation of ice, the Consolidated Car Heating Company, Albany, N. Y., has devised a new type electric heater. This apparatus is only $3\frac{7}{8}$ in. wide, $2\frac{1}{4}$ in. high and 24 in. long. It is placed directly across the line voltage and rated at 300 watts.

Powder for Cleaning Solution

FOR making a cleaning solution a powder with unusual qualities has been put on the market by the National Railway Appliances Company under the trade name of Soilax. În its original state, Soilax is a pink powder. In a proper solution with water it turns green. However, if too much powder is used, the solution will turn yellow. This feature prevents waste. The claim is made that 1 lb. of Soilax will do the work of 4 to 6 lh. of soap at a saving of 25 to 50 per cent in monthly cleaning costs. It is especially adapted for cleaning enameled or varnished surfaces, either inside or outside of street cars or buses.

Electrode Holder for Metallic Arc Welding

To FACILITATE the operation of welding, a new electrode holder called model T has been devel-O FACILITATE the operation oped by the Lincoln Electric Company, Cleveland, Ohio. The welding electrode is held firmly by a device consisting of a powerful clamp with an easy release to permit the rapid changing of electrodes. The grip is designed for easy holding and remains cool because the welding current is carried from the point of cable entry to the jaws by copper strips of low resistance. In the older types of holder, the high-amperage welding current was carried through the steel frame of the holder itself and uncomfortable heating frequently resulted under continuous service.

Copper tips on the jaws reduce the sticking of the electrode, resulting

in quicker and easier change of electrodes and longer life for holders. The shape of the holding clamps has been altered to give greater compactness to permit working in closer corners. All metallic parts of the holders are coated with non-tarnishing plating.

Machine for Removing Insulation From Wire

DESIGNED to reduce shop cost in removing insulation or skinning the leads of armature coils, the Type KP Peerless wire insulation remover is being placed on the market



This machine removes insulation from wires

by the Electric Service Supplies Company, Philadelphia, Pa. The machine has a special revolving brush, and by bringing the leads in contact with it, the insulation is removed thoroughly and effectively without damage to the copper wire. The revolving parts are guarded. Pressure is applied to force the wire into contact with the brush and is controlled through a foot-operated treadle.



This type of electrode holder has copper strips of low resistance which carry the current from the terminal to the copper

News of the Industry

Writing of Chicago Ordinance Begun

The actual writing of a new railway ordinance for Chicago has been begun early by the City Council subcommittee to which the task has been assigned. According to present plans the work will be completed by Sept. 1 and the ordinance will be submitted to the voters at the election on Nov. 5. If the ordinance is to go on the Nov. 5 ballot, it must be passed by the City Council not later than Sept. 24.

While the ordinance is being written the subcommittee charged with doing that work will hold a series of public hearings on subways in the hope of acquiring more information as to how much additional track space is needed for rapid transit through the central congested area. At the present time the Aldermen have no definite policy

on subways.

Every subway plan except one makes provision for a tunnel in State Street, but there has been no decision as to where any bores will be located. The number of tracks to be provided also differs in each plan. To aid them in their work, the Aldermen are studying the subways in other American cities and in Europe.

Two-Cent Wage Advance in Toledo

Employees of the Community Traction Company, Toledo, Ohio, broke a deadlock of almost three months' duration on July 20, when they balloted three to two in favor of a compromise proposal submitted after they had demanded arbitration and had previously turned down a 2-cent wage increase with modified working conditions. Steps will be taken immediately to draft the plan into contract form and sign it. The new contract will be retroactive to June 1.

Trainmen, bus operators and car shop employees will receive a flat increase of 2 cents an hour making the scale 52 cents an hour for beginners in the first three months. 54 cents for succeeding nine months and 57 cents an hour for all employees with the company more than a year. Five cents additional is paid to one-man car and bus

operators.

A new feature of the contract this year will be a premium of 1 cent an hour for any month during which the employee shall not have had any accidents which cost the company money chargeable to him.

Watchmen will receive \$5 a month raise. Regular employees will receive not less than two hours' pay for any call for extra

In case of split runs, when a man is called for three periods in a day, he shall receive not less than 10 hours' pay, and all workers shall receive not less than nine hours' pay for a day.

In the garage expert mechanics will receive 10 cents an hour increase. Here the working day is changed from a nine-hour to an eight-hour basis.

The compromise terms were arrived at in a conference between union officials and company representatives in the presence of Hugh D. Friel, conciliation commissioner of the Federal Department of Labor.

It was estimated that the changes would add more than \$75,000 a year to costs.

High-Speed Service in Kansas City

Kansas City Public Service, Kansas City, Mo., has been busy putting into effect high-speed service on three of its main trunk lines by a limited stop system and making of the routes of these lines stop streets. The speed of cars under the new plan has been increased more than 20 per cent. Company officials are said to feel that if they are able to hold the limited stop plan intact they will have accomplished, on these lines, at least, something really worth while.

The company laid its plans for a stop

program before the Public Service Commission. That body approved the pro-posal before it went into effect, subject to future jurisdiction and revision by the commission. Patrons in general appear to be well pleased with the increased speed and increased service. Such petitions as have been presented for the restoration of stops have in practically every case originated with the local corner grocer, the drug store and the picture show operator. The plan went picture show operator. into effect on June 16. Up to July 11 the company had made no changes nor had the commission ordered any.

\$33,000,000 Detroit Rapid Transit Project

Subway for surface cars suggested so designed as to permit ultimate conversion into a train-operated rapid transit line

AVOR LODGE of Detroit Mich. Mas received a report which proposes the construction of short sections on three routes of the four-line rapid transit system that the Detroit Rapid Transit Commission considers will ultimately be required, and the building of a section of subway for the special use of street ears, but so designed that trains ultimately may use all of its mileage except the loops. The report was prepared pursuant to the direction of the Mayor to the Detroit Street Railway Commission and the Rapid Transit Commission given shortly after the election held on April 1, when the rapid transit project submitted jointly by these two commissions was defeated at the polls.

The new plan, prepared jointly by the two commissions, is proposed as a means to afford immediate relief to the traffic congestion existing in the downtown district. At the same time it would mark the beginning of a rapid transit program involving the least possible mileage. According to the report, the two commissions have kept constantly in mind the necessity of having each section of the underground so located and so designed as to permit of ultimate conversion into a train-operated rapid transit line. The total milage is 5.44 and involves an expenditure of \$33,000,000.

The Rapid Transit Act and the City

Charter provisions permit the initial con-struction of a rapid transit system to be financed through the Rapid Transit Commission by the use of (a) direct taxation plus faith and credit bonds, (b) mortgage bonds, (c) special assessment or any com-bination of these methods. On the other hand, the street railway charter contemplates that all construction costs ultimately shall be paid out of the earnings of the sys-The right is not conferred to impose special assessments upon property that may be specially benefited by the construction of subways for street car or rapid transit train operation. Neither is there provision for raising any part of such costs by direct taxation upon the city at large.

The report points out the enormous benefits to property due to rapid transit lines as contrasted with surface transportation, for which reason the finance plans always have included special assessment for special benefit as an equitable and just provision. electorate approved this method of finaneing by an overwhelming majority in 1924 and again in 1925. As to the present proj-

ect the report states:

Whether underground construction is initiated now or five years from now, or is started by the Rapid Transit Commission. the D.S.R. or some other body, the city should not fail to preserve its right to specially assess for special benefit. In our judgment there is no question of the status of the present proposal as a rapid transit project even though it may temporarily be operated by street cars."

While the use of street cars in the tubes

COMING MEETINGS

Aug. 15-16—Wisconsin Utilities Association, Transportation Section, Hotel Northland, Green Bay, Wis.

Aug. 27—National Association of Railroad and Utilities Commission-ers, Glacier National Park, Mont.

Sept. 28 - Oct. 4 — American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium.

Oct. 23-24—Public Utilities Association of West Virginia, Wheeling, W. Va.

Nov. 6-7—Association of Electric Railway Equipment Men, Middle At-lantic States, Richmond, Va.

Nov. 21-32—Public Utilities Association of Virginia, annual meeting. Chamberlain-Vanderbilt Hotel, Old Point Comfort, Va.

will not produce the full benefit to the downtown district, 83 per cent of the congesting surface car movement will be taken away. Accordingly the two commissions recommend division of the total cost into three equal parts, \$11,000,000 each, one-

SUMMARY OF DETROIT'S SUBWAY SUGGESTIONS

\$8,500,000

9.700,000

7,400,000

SUGGESTIONS

1. A line commencing at a portal at Woodbridge Street and running under Woodward Avenue to a portal at Temple Avenue. Three stations; length main line 1.16 miles. Estimated cost....

2. A line commencing at a portal on Michigan Avenue at Sixth Street and running under Michigan Avenue to Campus Martius to Monroe Avenue to Randolph Street to Gratiot Avenue and under Gratiot Avenue to a portal at Rivard Street. Four stations; length main line 1.55 miles. City Hall loop and connection to Fort Street, length 0.17 miles. Total, 1.72 miles. Estimated cost

Total, 1.72 miles. Estimated cost

3. A line commencing at a portal on Fort Street at Fifth Street and running under Fort Street to Cadillac Square to Randolph Street to Jefferson Avenue and under Jefferson Avenue to a portal at Hastings Street. Four stations; length main line 1.20 miles. Estimated cost

4. A line commencing at a portal on Grand River Avenue at Second Avenue and Elizabeth Street and running under Grand River West and Grand River East to Madison Avenue and under Madison Avenue and under Madison Avenue to a temporary connection with the Vernor-Mack line at Gratlot Avenue and St. Antoine Street, with loop loading stations at Capitol Park and Library Park. Six stations; length main line 0.92 miles, loading toops 0.44 miles, total 1.36 miles. Estimated cost

7,400,000 .\$33,000,000 Total estimated cost...... Total length all four lines, miles....

third to the city at large, one-third to the locally benefited property, mainly in the central business district, and one-third to the car rider. While this division into three parts represents the recommendation of the two commissions, under the rapid transit act not more than 60 per cent of the estimated total cost may be raised by the first method. Accordingly the proposed financial plan involves the issue of faith and credit bonds to the extent of 60 per cent of the total, or \$19,800,000, and the issue of mortgage bonds for the remaining \$13,200,000. The faith and credit bonds and \$2,200,000 of the mortgage bonds

would be carried and retired by the contribution from the city at large and the locally benefited property.

Since the mortgage bonds can be secured only on the properties and revenues of the system, it is proposed that the revenues be secured by an inter-department operating contract whereby the D.S.R. pays a graduated rental to meet the interest and amortization of the \$13,200,000 mortgage bonds, but for the full term of the contract will be equalized so that the car rider will finally have paid only the interest and amortization charges on his one-third share of \$11,000,-The plan outlined will accord completely with the intent of the Rapid Transit

Act; states the report. As to the merging of the Ranid Transit Commission and the Street Railway Com-mission, the report states that their legal powers are so widely distinct that it is not advisable. However, a Metropolitan Board is suggested which would have control of all transit matters in the region of Detroit to continue the work of the Rapid Transit Commission, and in which the Street Railway Commission would have representation.



What Happens When the Public Transportation Service Is Forced to Suspend

Twenty-two Main Lines Reopened

New Orleans company fast recruiting train force locally. Railway directors state company position. Comment by Labor Secretary Davis

SERVICE has been restored on the 22 main street car lines of the New Orleans Public Service Company and officials declare the situation so far as patronage is concerned is improving daily. The company also has stated that the employment of trainmen is progressing so satisfactorily that it will soon have its entire personnel made up again of local men.

The Commission Council made a last effort on Tuesday to bring about a settlement between the company and the strikers, but it proved futile. The Public Service, but it proved futile. The Public Service, through A. B. Paterson, vice-president, Bernard McCloskey, and A. M. Lockett, directors of the company, definitely informed the Council that the directors had decided they would positively not negotiate with the union on a closed shop contract. The directors declared that they could not deal with an irresponsible labor organization. Officials of the union, augmented by international vice-president Fitzgerald, and Mr. Quinlan of Chicago, refused to make any concessions and what was considered as a last conference was brought to an end without accomplishing anything. The Council, however, an-nounced that it would continue its efforts to bring about industrial peace in the city.

Jitneys are being permitted to operate during the period of the strike without any regulation; that is, the usual \$5,000 surety bond for such operations is not being exacted.

Labor unions throughout the city have adopted resolutions requesting members not to ride the cars, and the public is being

asked to support them.

Traffic regulations have been virtually shot to pieces as a result of the enormous number of machines on the streets.

The threatened general sympathetic strike of all union labor organizations in New Orleans was not called on Tuesday night. The meeting of delegates representing the various trades decided not to strike, but to help the car men financially. voted to give the car men 5 per cent of

their pay per month. As a result of the meeting union men, headed by leaders who arranged city-wide mass meetings, marched in a body to the City Hall on Wednesday and their spokesman questioned the Council regarding resolutions adopted by the mass meeting. One resolution provided that the city take over the railway. Acting that the city take over the railway. Acting Mayor Walmsley announced that the Council would take up the question of issurance of bonds with the Board of Liquidation. The Acting Mayor also announced that the Council would not interfere with the operat on of the jitneys, declining, however, to pass an ordinance which would eliminate the \$5,000 surety bond feature of the law.

The union had also requested that R. S. Hect, J. C. Butler, and J. D. O'Keefe, directors of the Public Service, who are also members of the board of liquidation, be requested to resign the latter offices. Acting Mayor Walmsley announced that under the Constitution the city banks are authorized to select the members for life. It is not a Council matter.

At the close of the meeting with the Commission Council on Tuesday officials of the union issued a statement expressing regret that the efforts of the Mayor and The union Council had been defeated. places the blame for continuation of the difficulty on the shoulders of the company. A statement by the men concludes:

"There is nothing for the men to do in this struggle but continue on until justice and fair play are acknowledged by the company."

After receiving word from the New Orleans Public Service Company that the differences between the management and the striking employees are fundamental and cannot be arbitrated, the Secretary of Labor stated on July 24 that there is nothing more that the Federal Government's Conciliation service can do for the time being at least.

Secretary Davis said that he would keep Conciliator Rodgers in New Orleans be-

cause he believes that there is always the possibility that the company may change its mind. Conciliator Dines is in Washington at present preparing a report on the strike and it is stated that he will not be sent out again until additional orders are given by the Secretary. It was admitted by the Secretary that he had discussed the issue in the strike informally with Charles Rosen, attorney for the Public Service Company.

Asked to explain his conception of the differences between the company and the strikers, Secretary Davis said that the men claim they are seeking better wages while the company contends that it is seeking to

preserve its right of discipline.

One-Man Cars on Buffalo Interurban Runs

One-man cars are to be operated on the Buffalo-Lockport and Lockport-Olcott interurban divisions of the International Railway, Buffalo, N. Y. If the experiment proves successful, the company will rebuild the Buffalo-Niagara Falls high-speed line interurban cars for one-man operation, thus placing its entire system on a one-man car basis. All local lines of the company in Niagara Falls, Lockport and Buffalo now are operated by one-man crews.

No Parking Recommended on Fifty New York Streets

The abolition of parking in lower Broadway and fifty other streets and alleys from 7 a. m. to 6 p. m., and the prohibition of parking altogether in 65 streets throughout the city was recommended to the Board of Estimate of New York City at its meeting on July 25 by the Citizen's Street Traffic Committee of the City of New York, Inc. The proposals are included in Part 11 of a report by the traffic committee's sub-committee on parking.

Broadway between Bowling Green and

Broadway between Bowling Green and Twenty-fifth Street has been singled out among all the north and south thorough-fares of Manhattan as the one on which parking restrictions are most necessary, according to Chairman Banham, because of the regular all-day parking by busi-

ness men.

Dates of Meetings Changed to Avoid Conflict

The date of the November meeting of the Association of Electric Railway Equipment Men, Middle Atlantic States, has been changed from Nov. 20-21, to Nov. 6-7, 1929, to avoid conflict with the meeting of the Virginia Public Utilities Association, which convenes at Old Point Comfort, Nov. 21-22.

Chicago "L" Hearing Put Over Until Sept. 15

When, on July 16, Congressman Frank Reid, special counsel for the city of Chicago, announced that the city had no further evidence to offer against the Chicago Rapid Transit Company's appeal for a 10-cent fare, Master in Chancery Roswell B. Mason continued the hearing until Sept. 15.

Congressman Reid contended that the Rapid Transit Company, during its nine months of presenting evidence, had failed to make a case. The company is asking the federal court to restrain the Illinois Commerce Commission from

preventing the collection of the present 10-cent elevated fare in Chicago. The higher fare is being charged under the protection of a temporary injunction granted by the federal court.

The Rapid Transit company's recent evidence has centered about an attempt to show that its lines are worth at least \$160,000,000 instead of the \$60,000,000 valuation set by the city.

Prize for Traffic Solution Suggestions in Atlanta

To encourage public interest in the solution of this important public problem of traffic congestion, Two Bells, published by the Georgia Power Company, has announced the following contest:

test:

"For the essay outlining the best and most practicable suggestions for solving Atlanta's traffic problems, a prize of \$25; with a second prize of \$15, a third prize of \$10, and five prices of \$5 each. Eight prizes, totaling \$75, for writing out the thoughts you, no doubt, long have had in your mind about improving the traffic situation."

Everyone is eligible to compete with the exception of employees of the company and professional traffic experts and traffic engineers. The contest closes on Aug. 10.

Compromise on Substitution in Houston

The attempt of property owners on Fannin Street in Houston, Tex., to force the Houston Electric Company to remove street car tracks from that thoroughfare and substitute buses, has ended in a compromise.

The City Council has ordered contractors to proceed with widening and paving of the street, making no mention of the car tracks. As the paving will necessitate improvements to the track costing the company about \$40,000, it is generally understood that no further effort will be made to secure removal of the tracks.

Jeff Alexander, general manager of the Houston Electric Company, agreed to operate express buses on Main Street—the next parallel street—"as an experiment."

The controversy began eighteen months ago when contracts were let for the paving and widening of Fannin Street. Residents demanded tracks be removed and that a bus service be instituted. Oscar Holcombe, then Mayor, secured the services of John A. Beeler, who suggested removal of the tracks through about one-third of their length on Fannin and rerouting of the South End loop back to the downtown district over McGowan, a cross street, to the Travis Street line. No action was taken and the Holcombe administration was defeated, the Fannin Street matter being one of the chief campaign issues.

Efforts of the Fannin Street group to have the City Council pass a resolution setting out that service on Fannin with street cars is inadequate, and instructing the company to furnish such service were

unheeded by Council.

Fannin Street residents then asked the City Council to grant a franchise to an independent company to operate a two-way bus service on Fannin. This proposal was side-tracked when Mr. Alexander offered to establish a bus service on Main Street.

With the paving of Fannin, service by

With the paving of Fannin, service by bus will be substituted for the shuttle line which serves Rice Institute on the south edge of the Southern city. This bus service will not run to the downtown section, but will connect with the street cars at the end of the loop.

Late News Briefs

Richmond, Va.—It is reputed here that the Virginian Railway may continue its plan of electrification to Charleston, W. Va., if the New York Central bridge is constructed at Deep Water. While no announcement was made by the Virginian and nothing came out at the hearing to indicate the plans of the Virginian and the New York Central, the feeling is that this is the general scheme.

Omaha, Neb.—The safety campaign which the Omaha & Council Bluffs Street Railway is conducting in connection with the purchasing of new uniforms by all the trainmen is proving highly successful. The company has agreed to pay the entire cost of the uniforms for all men who operate for six months without an accident costing the company more than \$15. From July 1 to July 20, there was only one such accident—a new safety record.

Toledo, Ohio—The last of the changes in routing contemplated by the transit ordinance of July, 1928, in Toledo was put into effect by the Community Traction Company when the East Broadway us feeder line connecting also with the Oak Street car line in a loop operation was put on its new route during the week ended July 20. It replaces a portion of car line on East Broadway. Cars in city service continue out Woodville Road beyond the corner of East Broadway and Woodville following the Lake Shore Electric and Toledo, Fostoria & Findlay interurban routes.

Worcester, Mass.—Because operators of the 35-cent flat rate taxicabs established in Worcester sometime ago have been charging various rates the license board of that city has ordered the tariff to be printed on cards and displayed conspicuously in the cabs. The defense of the cab companies was that some of the drivers took an unfair advantage of their passengers.

Indianapolis, Ind.—Rates for commuters on all electric and bus lines operated by the Terre Haute, Indianapolis & Eastern Traction Company will be reduced from 1.65 cents a mile to 1.25 cents.

Waterloo, Ia. — Frank McDonald, superintendent of stores and purchases for the Waterloo, Cedar Falls & Northern Railroad, is chairman of the convention committee for the Iowa Electric Railway Association, which will hold its annual convention here Nov. 7 and 8. Terminal electrification will be one of the principal topics at the meeting, but the outline of the program has not yet been completed.

Detroit, Mich. — The Council has called a public hearing on parking situation as a result of demands from Business Property Association, Washington Boulevard Association and Retail Merchants' Association that police be directed to enforce strictly parking regulations in downtown district and be provided with sufficient men and towing equipment to do so.

Louisville, Kv.—Direct through service between Indianapolis and Louisville was resumed by the Interstate Public Service Company recently when the new

\$3,500,000 Big Four bridge across the Ohio River was opened to interurban traffic. Passengers no longer need to transfer at Sellersburg as was necessary for a year while the bridge was under construction.

Richmond, Va.—School tickets will be issued for the bus service in the Ginter Park section of Richmond when the tracks on Chamberlayne Avenue, Laburnum Avenue and Brook Road have been removed and bus service installed, under a tentative agreement reached between the city and the Virginia Electric & Power Company. There is still a difference of 1 cent in the railway and the bus fares, the former being 7 cents and the latter 8 cents.

Hartford, Conn.—All persons, associations and corporations owning or operating taxicabs in Connecticut are now common carriers, subject to the jurisdiction of the Public Utilities Commission. A law to this effect has been signed by Governor Trumbull. Within 60 days, owners must have certificates from the commission in order to continue operation.

New York, N. Y.—The 25th anniversary of the Interborough Rapid Transit Company was celebrated on July 20. While the first train was not run for the public's convenience until October 27, 1904, July 20 was the day on which the first unit of the tunnel system was completed and instruction started for train crews. The first section completed extended from the Brooklyn Bridge to Grand Central Terminal.

Roanoke, Va.—A car of the Roanoke Railway & Electric Company painted according to an experimental color scheme has been placed on the lines for the criticisms and suggestions of the public. The car has an Abbott gray body with Cherokee gray trimming above the window posts. The border is trimmed in green. The company may make a change, if a color scheme satisfactory to the patrons and distinctive for Roanoke can be decided upon.

St. Louis, Mo.—The special committee of the Transportation Survey Commission headed by Erastus Wells, vice-chairman of the commission, has taken no action yet on the suggestion of Engineer Kelker made in May recommending the rerouting of thirteen railway lines, the discontinuance of six lines, the establishment of one new line and a reduction in the stops to an average of eight to a mile.

Chicago, Ill. — Plans for a circular street car subway in Grant Park connecting with the Roosevelt Road surface lines by a tunnel under Michigan Avenue to Wabash Avenue have been submitted to the City Council's committee on railway terminals by its engineer, Edward J. Noonan. The plans were drawn upon the instructions of the Aldermen to permit street cars to enter Grant Park without destroying the beauty of the park.

Indianapolis, Ind.—The State Supreme Court has reversed a decision in the Circuit Court, which would have forced the state highway commission to stand the expense of improving the right-of-way of the Terre Haute, Indianapolis & Eastern Traction Company in a pub-

lic highway near Richmond. Litigation resulted from action of the commission in 1923 in paving approximately 1½ miles of roadway in the National road, including the railway's right-of-way. The commission alleged that under the state law, the railway was required to improve the space between the rails and 18 in., on each side when the tracks are laid on the public highway.

Rockaway, N. Y.—Chairman John H. Delaney, of the New York Board of Transportation has assured a representative of the allied transit committee of the Rockaway section that plans for transit relief in that area would be made public "within a few months." Mr. Delaney's statement was taken to indicate that transit relief for the Rockaways would be embodied in the second "\$600,000,000 subway building program," for which surveys are now being made. Residents of the Rockaways would like to see the branch of the Long Island Railway now serving their shore resorts made part of the city system.

London, Ont.—Employees of the London Street Railway decided on July 11 to accept the company's wage proposals for a two-cent-an-hour increase, effective on Sept. 1. The Ontario Railway and Municipal Board reported in favor of an increase more than seven months ago, but the company was unable to comply with the findings for reasons set forth at length in the Electric Railway Journal for April, page 555.

Cincinnati, Ohio—Sixty-eight formal meetings have been held with relation to the adoption of the four ordinances which, as finally passed permits the \$41,-000,000 Union Terminal project to be started to which reference was made in Electric Railway Journal News for July 20. Not willing to incur any possible difficulties due to technicalities or typographical errors in so important a project as the terminal, it was finally decided to call a special session of the City Planning Commission to go over the printed ordinances. A special meeting of the City Council then followed, to receive the Planning Commission's final report. Favorable action by the Council was then taken on the adoption of the ordinances.

Toronto, Ont. — Additional motorcoach service to that at present in operation in conjunction with the radial railways has been suggested, should the radial service be abandoned.

St. Louis, Mo.—The last of the open bench coaches of the St. Louis Public Service Company were burned at the company's graveyard in St. Louis County recently. The "moonlight" cars were used until 1927 on the Creve Coeur Lake line between the end of the Delar-Olive Street line in University City and Creve Coeur Lake.

Pittsburgh, Pa.—A resolution has been presented to Council to authorize the Pittsburgh Railways temporarily to abandon one set of the double set of tracks on Water Street between Wood Street and Smithfield Street.

New York, N. Y.—President Menden of the Brooklyn-Manhattan Transit Corporation, and President Hedley of the Interborough Rapid Transit Company at a public hearing before the Transit Commission on July 10, said that enforcement of the commission's recent ruling against the "keying" of trains past danger signals and automatic tripper devices. would make impossible the "practical operation" of rapid transit lines. They admitted that literal compliance with the order of "keying by" would prevent collisions, but contended that the rule would seriously delay traffic. Chairman Fullen adjourned the hearing until a later date.

Joplin, Mo. — The Joplin-Pittsburg Railroad on July 15 applied to the Public Service Commission for authority to acquire, operate and maintain the tracks and right-of-way of the former Joplin & Pittsburg Railroad between Joplin, Mo., and Pittsburg, Kan. The company would operate as a common carrier of freight. It crosses the Missouri-Kansas line at a point 1½ miles northwest of Asbury, Mo.

Baltimore, Md.—The park tax paid to the city of Baltimore by the United Railways & Electric Company showed an increase of \$7,000 for the second quarter of 1929 as compared with the corresponding period of 1928. The tax is 9 per cent of the money taken in for fares on most of the lines. The money is used to maintain the city parks. The tax for the second quarter was \$277,000 as against \$270,000 for the second quarter of 1928. Receipts of the United for April, May and June totaled \$3,963,276 and the park tax was paid on \$3,105,013, the remainder being receipts from lines not subject to the tax. The monthly receipts for the period were: April, \$1,331,013; May, \$1,365,-530; June. \$1,266,732.

Windsor, Ont.—An injunction to halt the projected transfer of the Windsor, Essex & Lake Shore Railway to the people of Windsor and eight other municipalities along its right-of-way is sought by a member of the East Sandwich Township Council. Consummation of the plan required the passage of enabling by-laws by the Councils of all communities interested. The East Sandwich Township Council did enact this legislation, but it is now asserted that business transacted at that session was unconstitutional.

Boston, Mass.—An early morning car is being operated to Elm Street on the Fellsway in Boston as a special service to night workers by the Boston Elevated Railway largely as an experiment. Early cars on other routes may be tried later if this trial is successful.

Ames, Ia.—The Fort Dodge, Des Moines & Southern Railroad has been permitted to discontinue its car line between the Iowa State College campus and the business section of Ames, Ia., until the opening of the school term in September. A bus line, also operated by the company, is furnishing service between the two sections of the city during the summer.

Toronto, Ont.—The question of salary and working conditions for employees of the Windsor railway is left open indefinitely as the result of a conference here on July 20 between representatives of the men and the Ontario Hydroelectric Commission, which operates the system for the local municipalities. At the close of the conference the only announcement was that another conference is to be held in "a month or so."

Recent Bus Developments

Twenty-Five Cent De Luxe Service for Baltimore

Plans to operate a de luxe passenger bus service between the fashionable Roland Park section and the downtown area are being made by the United Railways & Electric Company, Baltimore. The application is now before the Maryland Public Service Commission.

The route to be covered will be about 6 miles and the fare will be 25 cents each way. Seven de tuxe buses will be used to start the service, probably about Sept. 1. Each bus will carry nineteen passengers.

In establishing the service the United expects to eliminate much of the parking nuisance with which many of those living in Roland Park are forced to contend. The company promises to maintain a 10-minute headway in the morning and evening rush hours and

morning and evening rush hours and 20-minute headway during the rest of the day.

Adrian Hughes, Jr., superintendent of the bus department of the United, conducted a thorough canvass of residents who would be served by the line. More than 1,000 persons were interviewed and many of them said they would patronize the line. Part of the Roland Park section is served by two car lines.

Buses on Idaho-Washington Run

The last electric railway system in Idaho will pass into history on Aug. 1 with the removal of the tracks on the interstate bridge between Lewiston in that state and Clarkston, Wash., completed in compliance with orders from the City Councils of both cities. Mark Means, secretary-treasurer of the Lewiston-Clarkston Transit Company, operating the street railway, has received a permit to operate a bus line.

New Chicago-Alton Service Approved

Holding that the request of the Chicago & Joliet Transportation Company, Alton Transportation Company, and Illinois Traction, Inc., filed in September, 1928, should not be approved the Illinois Commerce Commission on July 16 cancelled the certificate of convenience and necessity granted to the Alton Company and issued to the Tri-State Bus Company a certificate to operate motor coaches between Chicago and East St. Lonis and intermediate points. The commission held that "by rendering a local transportation service that will transport passengers from intermediate points to 'all trains stop' stations," the bus service would "have a further tendency—to increase the amount of travel on the steam and interurban railroads."

It also held "that the existing steam and electric carriers cannot render service of the type, quality, kind and character so as to meet the demands of the traveling public and the people living on or near the proposed route," and, further "that by virtue of the difference charged in the per mile rate of fare, the bus traveling public, as counter-dis-

tinguished from the steam and electric public, is, in the great majority of instances, an entirely different class of the general traveling public."

Another Route Sought by County Transportation

The New York Public Service Commission was petitioned by the Port Chester-Glenville Bus Company and the County Transportation Company, Inc., on July 19 for authority to transfer to the latter its certificate of public necessity and convenience. The village authorities of Port Chester have approved the transfer. The County company now owns 60 buses and it will be able to assign buses and co-ordinate the various routes with the trains of the New York, Westchester & Boston Railway, to which the County company is allied, and provide increased facility of travel to the inhabitants of the territory covered. The commission will give a hearing later.

Alliance-Canton Service Still a Matter of Controversy

Claims that an effort is being made to wreck the Stark Electric Railroad were made by William Klinger, a member of the Ohio Public Utilities Commission, in his opinion opposing increased service between Alliance and Canton, Ohio, asked by the Salisbury Transportation Company. Stark Electric has opposed the Salisbury's request to run hourly service. At a hearing some months ago when the Salisbury company protested a request of the Stark Electric for increased service over a part of the Alliance-Canton route, it was charged that the bus line was being subsidized. Overriding Mr. Klinger's opposition, Roscoe C. McColloch, chairman of the commission, and Frank W. Geiger, granted the Salisbury company permission to follow a one-hour schedule. The two companies have battled before the Ohio Public Utilities Commission and the various courts of the state for months.

Supervision of New York Taxis Recommended

Taking up the perennial subject of taxicabs, the Citizens' Street Traffic Committee of New York suggests a new bureau to have charge not only of licenses but of regulation. The hope is expressed that by constant supervision, with adequate cooperation by the police, many of the existing inconveniences or abuses may be measurably abolished. It has been found, for example, that the stands where taxicabs are allowed to wait for fares are not so fully used as they should be. At special locations, also, there is evidence of favoritism and even of intimidation with respect to certain cab lines. The citizens' committee agrees with the Mayor that in New York there are too many taxicabs when they are not needed, and not nearly enough when they are. Whether this condition can be remedied by the proposed Board of Taxicab Control, says the New York Times, cannot be predicted in advance of actual trial.

Buses Between Allentown and Reading

Preparations are being made by the Allentown & Reading Traction Company to substitute bus lines for the interurban passenger routes. The trolley lines in Reading proper would be retained. The falling off of business between the two cities, and the need for a general realignment have brought about the change, particularly the fact that a fine highway connects both cities, affording excellent opportunity to serve passengers on the 35-mile run between the two Pennsylvania cities.

Baltimore, Md.—Permission granted by the Maryland Public Service Commission to the Baltimore Coach Company, a subsidiary of the United Railway & Electric Company, Baltimore, to operate passenger buses on the Registerstown road, was opposed by the Park Heights Civic Improvement Association, which has now been refused an opportunity to present additional testimony.

Alameda, Cal.—The Citizens' Transportation Committee has applied to the Railroad Commission for an order directing the Key System Transit Company to abandon its franchises and remove its railway tracks from the corner of Park Street and San José Avenue, along Park Street and over the Park Street bridge, and to operate bus service in lieu of the railway service over Park Street and thence by the most direct route to East 14th Street in Oakland.

Columbus, Ind.—Two new buses of the Interstate Public Service Company intended to supplant street cars running from Columbus, Ind., to Maple Grove and East Columbus, have been put into operation.

Rochester, N. Y.—Authority was asked of the Public Service Commission by the New York State Railways on July 22 to substitute buses for trolley cars on the Rochester & Sodus Bay division of its line. It is proposed to use Mack and White parlor car type buses seating 29 passengers as well as two five-ton freight trucks and one tractor with two trailers. Ordinary baggage will be carried on the buses. The town boards of Irondequoit and Penfield and village of Webster have agreed to the substitution.

Worcester, Mass. — No decision has been reached by officials of the Worcester Consolidated Street Railway on the course to be pursued to obtain a permit to operate buses in Millbury and Bramanville in place of railway service. The Worcester license commission has authorized the Consolidated to operate in Worcester, but the Selectmen of Millbury have refused to permit the company to operate in that town. Consolidated officials probably will ask for a conference with the Millbury selectmen in an effort to settle the difficulty.

Newark, N. J.—The largest chartered bus order ever placed with the Public Service Co-ordinated Transport is that of the Wright Aeronautical Corporation, for an excursion of 120 buses from Paterson to Lake Hopatcong, N. J., on Aug. 2. This exceeds by nine buses the largest previous order, which was for a recent excursion of the Prudential Insurance Company.

Financial and Corporate

Earnings Improve in Baltimore

An increase in net over the corresponding month of 1928, after charging off the added amount for depreciation ordered by the Maryland Public Service Commission, is reported by the United Railways & Electric Company, Baltimore. It is the fourth consecutive month in which the company has shown increased net income. The increase in net for this June over the corresponding month of last year was \$3,701, after setting up \$67,794 more for depreciation than in June, 1928. Economies in management showed a saving of \$57,766.92, or 6.70 per cent for June. For the six months' period of 1929 pas-

For the six months' period of 1929 passenger revenue increased \$170,811, and economies in management saved \$224,683, as compared with the first six months of last year. However, the increase in depreciation reserve amounted to \$416,296 more in the first six months of this year than in the similar period of 1928, resulting in a net income so far this year of \$195,687, as against \$229,647.56 for the

first six months of last year.

Insull Interests After Indiana Union Traction

Interests representing Samuel Insull are reported to be making final overtures to gain control of the Union Traction Company of Indiana. A bid of about \$2,829,000 is said to have been made for properties of the company, now in receivership, against which more than \$14,201,000 mortgage bonds are outstanding. It is understood that committees representing various bond-holders' groups have been meeting the last few days in Philadelphia to sign an agreement with the Midland Utilities Investment Company, Insull holding corporation, for sale of the bondholders' rights on condition that 60 per cent of the outstanding securities be delivered.

Excellent Year in Toledo

The first twelve months of operation under the new transit plan at Toledo, Ohio, co-ordinating bus and railway service under direction of the Community Traction Company, and eliminating independent and competing lines, showed \$3,900,274 revenue compared with \$3,504,766 for the previous twelve months. This was a gain of 11.28 per cent, made during a period in which service was increased 16 per cent. Expenses increased only 5.20 per cent.

Some 52 506 378 passengers were care.

Some 52,596,378 passengers were carried, an increase of 5,016,859 over the previous year, or a gain of 10.54 per cent. Crosstown lines, operated for the first time by the company, carried 943,704 passengers. Special school buses carried 45,806 passengers in addition to

those using regular lines.

The company is spending more than \$100,000 a month now on its improvement program. This includes new tracks on all streets in which the city is laying new pavement.

The company has abandoned \$1,500,000 of property since the Milner ordinance became effective and has increased

its plant investment account \$750,000 since 1921. It has outstanding \$6,181,000 of first mortgage bonds and \$1,226,000 of 7 per cent preferred stock. The city now owns \$1,819,000, par value, of the railway's common stock.

During the last twelve months \$160,-504 was credited to the stabilizing fund.

The favorable showing of the company is one of the achievements claimed by Mayor W. T. Jackson in his campaign for re-election. Thus the city transportation system is injected into the city campaign for the first time in history to advertise its good record.

Holding Company Case at St. Louis Appealed

On July 19 the City of St. Louis and former Judge Henry S. Priest acting on behalf of certain minority stockholders of the St. Louis Public Service Company appealed to the Cole County Circuit Court from the ruling of the Public Service Commission on April 26, last, which authorized the City Utilities Company, a Delaware corporation, to acquire and control more than 10 per cent of the capital stock of the St. Louis Public Service Company. The city contested the holding company's application on the ground that it was not legally qualified to do business in Missouri and further that it was not adequately equipped to render the railway the financial and administrative assistance promised.

Review of Boston "L" Year

Careful economy made it possible for company to avoid deficit—Against further extensions at expense of car rider

POR' the year ended June 30, 1929, the Boston Elevated Railway was able to meet all operating expenses and fixed charges. No balance is available over and above the amount necessary to restore the reserve fund to the original amount of \$1,000,000 as provided in the Public Control Act. At this time, therefore, no further payment can be made in reduction of the balance still due to the municipalities on the assessment made in 1919. Only through the most careful economy was the railway able to avoid a deficit. With respect to service rendered, the railway, during the last year, actually operated 65,000 more miles than in the previous year.

Receipts declined \$697,127 for the year ended June 30, compared to last year. Partially offsetting this decrease in receipts was a reduction of \$610,061 in operating expenses as compared with the actual operating expenses applying to the year ended June 30, 1928. From actual operations covering the year ended June 30, 1929, there was an excess of cost of service over receipts of \$180,153 compared to an excess of receipts over cost of service of \$82,811 from actual operations during the year ended June 30, 1928.

The deficit of \$180,153 was met in part by a dividend of \$150,000 from the Transit Mutual Insurance Company created in 1921 to carry the workmen's compensation insurance of the company. This dividend represents savings to the car riders through the operation of the Mutual Insurance Company. The balance was met by inventory and other profit and loss adjustments

Conspectus of Indexes for July, 1929

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY Electric Railway Engineer, Worcester, Mass.

		Month	Year	Last 5 Years	
	Latest	Ago	Ago	lligh	Low
Street Rallway Fares* 1913 = 4.84	July	June	July	July	Jan.
	1929	1929	1928	1929	1924
	7. 76	7.76	7.64	7.76	6.91
Electric Rallway Materials* 1913 = 100	July	June	July	March	Feb.
	1929	1929	1928	1924	1928
	147.5	145.8	141.8	163.9	139, 5
Electric Rallway Wages* 1913 = 100	July	June	July	July	Jan.
	1929	1929	1928	1929	1924
	230.9	230,8	229, 2	230.9	217.4
Am. Elec. Ry. Assn. Construction Cost (Elee. Ry.) 1913 = 100	July	June	July	March	July
	1929	1929	1928	1924	1929
	199,0	199.7	203.3	206.8	199.0
Eng. News-Record Construction Cost (General) 1913 = 100	July	June	July	March	Nov.
	1929	1929	1928	1924	1927
	204.8	205.6	206.6	224.7	202.0
U.S. Bur. Lab. Stat. Wholesale Commodities 1926 = 100	June	May	June	Nov.	April
	1929	1929	1928	1925	1927
	96.4	95.8	97.6	104.5	93.7
Bradstreet Wholesale Commodities 1913 = 9, 21	July	June	July	Dec.	July
	1929	1929	1928	1925	1924
	12.49	12.46	13.14	14,41	12.23
U. S. Bur. Lab. Stat.	June	May	June	Nov.	May
Retail Food	1929	1929	1928	1925	1924
1913 = 100	154.8	153.3	152,6	167.1	141.0
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	June	May	June	Nov.	April
	1929	1929	1928	1925	1929
	160.0	159,4	160.9	171.8	159.3
Industrial Activity Elec.World—Kwhr. used 1923-25 = 100	June	May	June	Feb.	July
	1929	1929	1928	1929	1924
	135.2	136.9	116.4	140.4	73.4
Bank Clearings Outside N. Y. City 1926 = 100	June	May	June	Feb.	May
	1929	1929	1928	1929	1924
	102,2	102.5	104.5	110,1	84.4
Business Failures Number Liabilities (Millions)	June 1929 [477 64, 22	May 1929 1733 44,90	June 1928 1639 46.16	Jan. 1924 2231 122.95	Sept. 1928 1348 23.13

*The three index numbers marked with an asterisk are computed by Mr. Richev. as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen, conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these roads.

incidental to the closing of the year's accounts.

Attention is directed to the reduction this year of \$610,061 in operating expenses, a sum lower than for any year since that ended June 30, 1923, when a lower wage scale was in effect than at present.

The decline of \$697,000 in gross revenue is attributed by Edward Dana, general manager, to two factors: First, continning and increasing depression in summer riding; and second, the increase in automobile riding, especially during the open winter last year. Neither factor is one over which the railway has control.

As evidence of the increased need of mass transportation, Mr. Dana points out that in spite of the decline in total passen-

mon for each share of prior preferred held. Holders of the present preferred will receive two shares of Class C for each share held. Holders of the common will receive one share of Class C for each share held.

In order to obtain the funds to caucel the first mortgage, every exchange below the first mortgage is conditioned upon the compulsory subscription to one share of the new preferred at \$25 a share for each \$100 par value of existing securities. The new preferred carries \$1.50 dividend.

The present second mortgage bondholders will be required to subscribe to only such portion as may not be met by securities junior to this mortgage up to the limit of one share for each \$100 par held.

The plan will be effected by foreclosure

allowance to 3½ per cent of the depreciable value of its properties, raising this item from \$800,000 to about \$1,400,000 annually. To sustain its request for a greater depreciation reserve the company pointed out that the city is now engaged in an extensive street widening program which will require the railway to remove or replace many miles of tracks imposing a burden heavier than it had ever faced before.

Dividend Action Criticized

Action of the Philadelphia Rapid Transit Company in declaring a \$1 extra dividend on common was characterized as "a challenge to the people of Philadelphia" by Harold Evans, former Public Service Commissioner. He questioned the propriety of taking \$600,000 out of the company's surplus. Criticism also was directed at the board's action because the Philadelphia Rapid Transit has been asking an increase in fares. S. Davis Wilson, city controller, urged action by the taxpayers in the event the City Council, acting under an agreement of 1907, failed to disapprove of the expenditure.

Action Soon in Indiana Merger

The \$70,000,000 utility merger case in Indiana now pending before the Public Service Commission has moved a step nearer hearing with the completion of field work of the auditors who have been studying the books of the companies involved. Howell Ellis, a member of the commission, says the next step will be preparation of exhibits showing facts pertinent to the merger case. These exhibits will be made from the audits. Meanwhile engineers of the commission are at work investigating the condition of the physical properties of the various utilities sought to be merged. This investigation will not be completed for several weeks.

Among the companies involved in the merger are: Car Trust Equipment Company, Indianapolis & Northwestern Traction Company, Indianapolis, Crawfordsville & Danville Electric Railway, Indianapolis, Martinsville Rapid Transit Company, Indianapolis Street Railway, Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute Traction & Light Company, and Terre Haute & Western Railway.

Chicago Railway's Principal

The Chicago Railways will begin paying off its \$55,655,000 first mortgage bonds. On or about Aug. 1, the bondholders will receive about \$5,565,000 as a 10 per cent payment on the bonds, which have been in default since Jan. 31, 1927, when the ordinances under which the Chicago Railways and the Chicago City Railway expired and the bonds matured.

This will be the first payment on the principal in the two and a half years the company has been in receivership. However, the semi-annual interest payments at the annual rate of 5 per cent have been kept up under order of Federal Judge Wilkerson, so that the bondholders will receive \$1,390,000 additional as interest due

on Aug. 1.
Albert W. Harris, chairman of the bond-holders', protective committee, has appealed to holders who had not yet deposited their bonds with the committee to do so in view of the prospective reorganization.

COMPARATIVE DIVISION OF RECEIPTS AND EXPENDITURES OF THE BOSTON ELEVATED RAILWAY FOR THE YEARS ENDED JUNE 30 1928 1929

thinwhi for the thing and a train	1928	1929
Total receipts	\$35,009,933	\$34,312,806
Operating Expenses		16,295,105
Wages	16,826,418	
Material, supplies and other items	3,155,788	3,064,407
Injuries and damages	1,191,690	1,210,168
Injuries and damages	3,814,336	2,847,900
Depreciation	1,094,966	1,055,746
Total operating expenses	\$25,083,391	\$24,470,322
Taxes	1,793,128	1,605,086
Dividends (including rent of leased roads)	3,149,857	3,139,874
	2,269,193	2,560,315
Subway and tunnel rents	3,553,097	2,538,583
Interest on B. E. bonds and notes		85.771
Miscellaneous items	78,448	03,771
Total cost of service	\$34,927,121	\$34,492,959
Loss or gain not including profit and loss items	82,811	180,153
	812,706	180,153
Profit and loss delayed items	012,700	100,133
Total loss or gain including profit and loss items	\$895,518	\$00

ger revenues, there has been a substantial increase in weekday traffic for the eight months of the year from October to May, inclusive. This average weekday traffic during the eight months period is more than 1,120,000 passengers under the present 10-cent and 6½-cent fare, compared to 984,-619 in 1920, the first year of the 10-cent fare, and 1,088,548 in 1917, the highest point of the 5-cent fare.

The additional rental of \$30,000 a month on the portion of the Dorchester Rapid Transit Extension in use when rental began in October, 1928, added to the burdens to be overcome during the past year. The total rental charges on subway, tunnel and rapid transit lines increased by \$291,116 this year as compared to last year. In conclusion Mr. Dana says:

"Since it is very evident that present revenues are barely sufficient to meet the present cost of service, it should be apparent that further rapid transit extensions at the expense of the car rider alone cannot be undertaken."

Terms of Tentative Key Plan

The reorganization committee of the Key System Transit Company, Oakland, Cal., has promulgated a readjustment plan whereby it is proposed to reduce funded debt to \$4,675,000 from \$19,436,000.

Holders of the \$1,175,000 of 5½ per cent equipment bonds will receive 50 per cent in cash and 50 per cent in new 6 per cent equipment trust certificates plus \$200,855 interest in cash. Holders of the \$8,862,000 general and refunding second mortgage bonds will receive preferred stock of two series conditioned on bond interest. Holders of the \$2,500,000 collateral trust 6s will receive convertible preferred. All of this stock is to be issued on the basis of one share for each \$100 par of bonds.

one share for each \$100 par of bonds.

Holders of the present prior preferred will receive 1½ shares of new Class A com-

of the first mortgage. It is stated that the foreclosure price will undoubtedly leave no values for any undeposited securities junior to the first mortgage and failure to subscribe will result in the cancellation of such junior equities. Option is extended to the first mortgage holders to receive in full equipment trust certificates instead of part cash. The committee says a substantial amount of bondholders have so elected in advance.

Depreciation Accounting Reply

The St. Louis Public Service Company, St. Louis, Mo., on July 22 filed with the Public Service Commission a reply to the recent complaint of City Counselor Muench demanding an accounting of an \$8,369,931 depreciation reserve which the city alleged the company took over from Receiver Rolla Wells of the United Railway on Nov. 30, 1927. Stanley Clarke, president of the Public Service Company, said:

"The property was sold at foreclosure free from all liabilities other than those set forth in the decree of the United States District Conrt. Receiver Wells was charged with the obligation of paying off the matured indebtedness of the receiver and the insolvent company. As a matter of fact there was an insufficient amount to pay off such obligations

pay off such obligations.

"As a result no depreciation fund what-soever was acquired by the company from the receiver. Since Dec. 1, 1927, when it acquired the properties, the company has been setting up a depreciation fund pursuant to the orders of the commission."

The reply states that the present depreciation reserve as set up by the company is \$756,331.

Mr. Clarke characterized the complaint of Counselor Muench as unwarranted and designed to mislead the people.

The company further asks the commission to increase the annual depreciation

Personal Items

Charles Gordon, Managing Director

Engineer, executive and journalist selected to succeed
Lucius S. Storrs in American Electric
Railway Association Post

CHARLES GORDON, editor of ELECTRIC RAILWAY JOURNAL, has been named managing director of the American Electric Railway Association, a post he is to assume on Sept. 1 next. He was selected for appointment by a sub-committee of the Advisory Council of the association on July 9 and the appointment was confirmed by the executive committee on July 12, at which time J. H. Hanna, who presided in the absence of President Paragraph (1997).

on July 12, at which time J. H. Hanna, who presided in the absence of President Barnes, officially notified Mr. Gordon of the recommendation of the Advisory Council and the action of the executive committee. Mr. Gordon succeeds Lucius S. Storrs, now chairman of the executive committee of the United Railways & Electric Company,

Baltimore.

It is agreed that no editor can be an influence who is lacking in positive opinions and has not the power of reiteration. Dana, Raymond, Godkin, and in more recent times Cobb, were all men that met this measure, on which James Ford Rhodes, the historian, lays great stress. It is the measure that Charles Gordon meets. He has positive opinions. He has reiterated them time and time again, but not for the mere sake of writing. He expressed himself in the JOURNAL because his mind was full of the things to which he turned his pen—visions of the local transportation industry in its relation to city planning, its bearing on the terminal situation in our fast growing cities and in its other broad economic aspects.

Mr. Gordon has been nationally active in transportation affairs for a long period, and as editor of the JOURNAL he has traveled widely and spoken in the interests of modernization of local

the interests of modernization of local transit service. He has advocated modernization of electric railway properties and co-ordinated rail and bus service under single managements. Ever since he left the service of the Chicago Railways in 1923 to become Western editor of ELECTRIC RAILWAY JOURNAL he has carried on militantly as journalist and editor in advocacy of those things he recognized as likely to be for the greatest good of the industry. Recognition of the high editorial standards achieved in this activity came with the award to the JOURNAL in 1928 of the first Associated Business Paper medal for outstanding service by a business paper to its industry. In fact, it is doubtful if any other man in the industry has devoted himself with greater zeal and enthusiasm than has Mr. Gordon to the task of rehabilitating the electric railway as an agency of transportation and restoring it to its proper place in public esteem.

All the various phases of street railway and bus operation have attracted and held his attention. He has advocated the use of the bus not only as a supplement to the street car but to provide a service of its

own wherever circumstances would warrant. In all these larger activities he has not, however, lost sight of the importance of personnel work, sound financial policy, the economics of street traffic, and the details of operation, maintenance and construction. Valuable in his new post should be his ability to express himself clearly, forcefully and candidly as a speaker.



Mr. Gordon was graduated from the University of Illinois, railway electrical engineering department in 1912. His first position was with the Chicago Railways Company. There he was engaged in electrical and mechanical test work under John Z. Murphy, then chief engineer. When the Chicago Surface Lines was formed as an operating entity he remained with that company until 1917, when he entered the Army Air Service. On his discharge in April, 1919, he joined the sales force of the Vacuum Oil Company as a special engineer. The following year he was appointed equipment engineer of the Chicago Surface Lines. In this capacity he served under H. H. Adams, superintendent of equipment, and was responsible for many phases of the development of rolling stock and maintenance practice on a system operating some 4,000 surface cars engaged in the most difficult of city service. He organized an equipment engineering department which quickly became a strong factor in the improvement of equipment department practice. From the Chicago Surface Lines he went to Electric Rail-

WAY JOURNAL as Western editor in 1923. As this very brief review indicates, Mr. Gordon is an engineer by profession, an executive by training and a journalist by prediliction. He will take to the task of managing director the broad, intimate contact that his work as editor has given him with all phases of community transportation, a type of experience it would be difficult to duplicate. In his new post he should loom even larger than he has in the past as writer and editor, as an influence in shaping the policies of organized mass transportation agencies in meeting their responsibilities as public servants, and in anticipating the opportunities for expansion offered by the growing problem of moving people and commodities in modern communities.

D. E. Druen in New Post

D. E. Druen, in the service of the Kansas City Public Service Company, Kansas City, Mo., since June, 1920, succeeds to the position of superintendent of equipment, made vacant by the resignation of R. S. Neal, who goes to the Texas Company in a street railway engineering capacity. In assuming the position vacated by Mr. Neal, Mr. Druen becomes the head of the mechanical department. In addition to the work he takes over at the Tenth and Lister shops he will still retain his title as superintendent of the bus and garage department.

Mr. Druen has been at the head of a special engineering department, at the Tenth and Lister shops, organized to carry on a widespread work of research, planning and inspection. In addition to this work, he has also remained at the head of the bus and garage department. His connection with the Kansas City property, as indicated previously, dates from June, 1920, when he entered the service of the Board of Control of the Kansas City Railways assigned to research and planning work concerned with the rehabilitation of the power plant at Second and Grand.

rehabilitation of the power plant at Second and Grand.

When R. W. Bailey became head of the power department, Mr. Druen was appointed assistant superintendent of power. This was in January, 1921. During the interval between 1921 and 1927, when the plant possed to the

1927, when the plant passed to the Kansas City Power & Light Company, the old power house, under Mr. Bailey's direction and Mr. Druen's supervision, was brought up from a questionable state of usefulness to one of the highest in efficiency. The scope of this work included the installation of a complete steam plant. The system of handling coal and ash was entirely revolutionized. The power producing facilities were also rehabilitated and the plant commenced to repay in the shape of savings to its owners. With the passing of the power plant, Mr. Druen was appointed superintendent of the bus and garage department. Here another job of planning and organizing confronted him. Thence he went to the special engineering department.

Don E. Druen was graduated from the University of Wisconsin with the class of 1913 with the degree of C.E. Immediately upon graduation he was appointed assistant city engineer at Miles City, Montana. In 1917 he was appointed city manager of Glendive, Montana, a position he resigned in 1920 to enter the services of the Kansas City Railways.

I. W. Welsh With Cleveland Railway

Executive secretary of American Electric Railway Association resigns to accept an executive position under President Alexander. To participate in work of co-ordinating surface and rapid transit operation

AMES W. WELSH, executive secre-J tary of the American Electric Railway Association since 1921, is to become engineering assistant to Joseph H. Alexander, president of the Cleveland Railway on Sept. 1. His appointment is the first major addition to the railway's executive staff since Metropolitan Utilities Inc., controlled by the Van Sweringens, took over

the company.

As a specialist in engineering and traffic problems, Mr. Welsh is expected to devote much of his time to the problems which the railway will face in its great expansion period just ahead, when it must co-ordinate its surface and rapid transit lines and evolve policies of transportation to fit a changing situation. In this program Mr. Welsh will be called upon to assist in the development of a plan for



J. W. Welsh

the co-ordination of the company's present surface street car and bus lines and the rapid transit lines which the Van Sweringens will build to the east and west

of the Public Square.
As his first work at Cleveland Mr. Welsh will devote considerable time to a study of will devote considerable time to a study of the railway's traffic problems, its co-ordi-nation plan and particularly to transporta-tion research. The traffic study will be of a dual nature, attempting to speed up traffic and eliminate congestion in now crowded districts, and to determine where traffic will originate in the future.

Since Mr. Alexander is an engineer, his contacts in the past naturally have been more with the engineering departments of the railway. He now expects to be able to devote more time to other departments and other problems, with Mr. Welsh giv-ing his attention to engineering problems.

In tendering his resignation to the association Mr. Welsh said:

"I wish to express my regret in severing a relationship which has existed for eight years in my present office, and to record my high regard for the wide acquaintanceship throughout the industry, and the closer friendships among the officers and committee members which I appreciate more than I can tell you. I wish the ensuing management of the association a full measure of success, and I pledge my co-operation."

Mr. Welsh has been secretary of the association since 1921. Before that he was

the association's special engineer. Until his appointment as engineer of the asso-ciation, he was in Wasnington, D. C., as-sociated with A. Merritt Taylor, manager of the passenger transportation of the Emergency Fleet Corporation of the United States Shipping Board. Mr. Welsh, who served on Mr. Taylor's staff, assisted in providing transportation facilities to the various shipyards on the Atlantic and the Pacific Coast as well as correcting existing

shortcomings where they were present.

Previous to that Mr. Welsh was electrical engineer and traffic agent of the Pittsburgh (Pa.) Railways, with which he became associated in 1906 as assistant electrician. In 1910 he was made electrical engineer and in 1913 took charge of the traffic department. Some of his earlier traffic department. Some of his earlier electrical engineering experience was gained in the employ of the National Tube Company, Wheeling, W. Va., and also in the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

Mr. Welsh was graduated from Wittenberg College in 1900, Harvard University in 1901, and Massachusetts Institute of Technology in 1903.

New South Wales Official on Tour

S. A. Maddocks is on a visit to the United States empowered by the New South Wales government to inquire into transportation administration and operation with a view to incorporating any methods he believes might be advan-tageously adopted by his home govern-ment, which has a traffic bill under consideration at the present time. He favors co-ordination of transportation so that the public might get the maximum benefit of each form. To illustrate his point, Mr. Maddocks mentioned To-ronto, Philadelphia and Berlin as among the cities which have done most for co-ordination. He feels that the operation of the street cars and motor coach or bus systems under the one administration is infinitely wise. In New South Wales, he pointed out, the railways and tramways are government-owned, but the lack of co-ordination has led to an undesirable situation. Mr. Maddocks expressed admiration for the linked up transcontinental rail-air service.

A. L. Merritt Completes Twenty-Five Years as Superintendent

The twenty-fifth anniversary of Abraham Lincoln Merritt's connection with the Interborough Rapid Transit Company, New York, as general superintendent of the subway division was celebrated on July 20 when forty members of his staff surprised Mr. Merritt in his office. Mr. Merritt's well-wishers included some of the first corps of motormen, conductors and guards whom he had put to work in the original "Belmont Tube" in 1904. Mr. Merritt, in responding to the congratulations from his staff, described the first run made in the subway from City Hall to the Grand Central Terminal.

New Head of Columbus Property Has Had Varied Career

Benjamin W. Marr, who on July 1 was elected president of the Columbus Railway, Power & Light Company, of Columbus, Ohio, succeeding C. C. Slater, has had a varied business career. For a time he was a hardware merchant in Huntington, W. Va., and Catlettsburg, Ky. He later became vice-president and general manager of a company which manufactured hickory tool handles in Louisville, Ky. He is still a vice-president of the Gwinn Bros. Milling Company, Huntington, and was secretary of the Gwinn Milling Company, Columbus, for twenty-one years prior to last March, when he resigned to become chairman of the board of directors and chairman of the executive committee of the Columbus Railway, Power & Light Company. Prior to this he had been a director of the company for ten years.

C. C. Slater, retiring president, has been

general manager, vice-president and president of the company. He was made president in 1928. During his régime the property was rehabilitated physically. He made



B. W. Marr

one cut in light and power rates, placed new cars in operation, started bus service, inaugurated the skip stop system of car operation, raised the street car speed limit, rebuilt practically all the trackage and paved streets at a total cost of about \$2,000,000.

Sir Felix Pole With Associated **Electrical Industries**

Surprise was caused in British railway and other engineering circles by the announcement in June that Sir Felix Pole had resigned as general manager of the Great Western Railway to become chairman of Associated Electrical Industries, Ltd. For the last eight years Sir Felix has been general manager of the Great Western Railway, a post which he has filled with great credit and distinction. He will still retain his connection with the railway as a consultant. Associated Electrical Industries, Ltd., of which he becomes chairman, is a holding company recently formed which controls the British Thomson-Houston Company, the Metropolitan Vickers Electric Company, the Metropolitan-Vickers Electrical Export Company, the Edison-Swan Electric Company and Ferguson Pailin. All these are names of importance in the world of manufacture of electric machinery and appliances, traction and other.

D. W. Pontius Heads Pacific Electric

Other changes in personnel include appointment of A. T. Mercier as vice-president and general manager of that company and F. L. Annable to the presidency of the San Diego & Arizona Railroad

HIGH and well-deserved honors were bestowed with the election of D. W. Pontius, formerly vice-president and general manager of the Pacific Electric Rail-way in Southern California, to the presidency of that property on July 1. He succeeds Paul Shoup, formerly president of both the Southern Pacific (Pacific System) and Pacific Electric Railway.

Advanced to the position formerly held by Mr. Pontius is A. T. Mercier. He leaves the post of president and general manager of the San Diego & Arizona Railroad, while the vacancy created by Mr. Mercier's advancement will be assumed by F. L. Annable, previously general su-perintendent of the Pacific Electric, who now becomes president of the San Diego & Arizona property.

Mr. Pontius made his start in 1891 as clerk in the roadmaster's office of the Pennsylvania Railroad in Ohio at \$30 a month. Step by step he has advanced in his chosen field, having served successively as opera-

tor, agent district freight and passenger agent, traffic manager, general manager, and vice-president and general manager, serving during his railroad career with the Pennsylvania Railroad; Chicago-Great Western Railway; Northern Pacific; Union Pa-

cific; San Diego & Arizona Railroad; Southern Pacific, and Pacific Electric Railway. During the World War he was sent to San Diego as general manager of the San Diego & Arizona Railroad, which was under construction When this at that time. project was completed he returned to the Pacific Electric Railway as vice-president and general manager, a post he has filled until the resignation of Paul Shoup.

In addition to his efficient management of the world's largest electric interurban railway system,

Mr. Pontius has for the past several years been active in civic affairs. He is president of the Los Angeles City Health Commission, executive vice-president of California's Mission Play, treasurer and member of executive committee of the Los Angeles Traffic Commission, and director of the

United States National Bank.
One of Mr. Pontius' hobbies has been the promotion of social and group activities among employees of the company. Among his many accomplishments in this regard are the development of a \$120,000 employees' mountain resort in the San Bernardino Mountains, and the erection of a \$450,000 club building for the Pacific Electric employees, now being completed by the railway under his direction.

MR. MERCIER A FORMER TRAFFIC MAN

As vice-president and general manager, Mr. Mercier's addition to the executive forces of the Pacific Electric Railway brings to that property a man of many creditable achievements, both as an engineer in construction work and railread neer in construction work and railroad operation. Mr. Mercier is a graduate of Rughy Academy, a preparatory school for

entering Tulane University, in which institution he completed a course in civil engineering. He began his railroad career in 1904 with the Southern Pacific as traffic man, continuing until 1906 as roadmaster and assistant gang foreman at Los Angeles.

During 1906 and 1907 he was assistant engineer in charge of reconstruction work in the Colorado River District, following



Top, D. W. Pontius. Lower left, A. T. Mercier. Lower right, F. L. Annable

which he was engineer in charge of steel construction for the Southern Pacific in Southern California. From 1908 until 1917 he was assistant division engineer and later division engineer of several operating divisions of the Southern Pacific. In February, 1917, he was appointed assistant superintendent of the Shasta Division. In September, 1918, he was made superintendent of the Portland Division, where he remained until his appointment as general mained until his appointment as general manager of the San Diego & Arizona Railroad. With the death of J. D. Spreckles about a year ago, Mr. Mercier succeeded to the presidency of the San Diego & Arizona Railroad, having held the office of Arizona Railroad, having held the office of Arizona Railroad, having manager until his president and general manager until his appointment as vice-president and general manager of the Pacific Electric Railway early last month.

Mr. Annable began his railroad career with the Atchison, Topeka & Santa Fé Railway (Coast Lines) at San Bernardino in 1893. He was later transferred to Los Angeles and then to Winslow, Ariz., with the same company. From 1904 to 1910 he held the position of chief clerk to the superintendent of the Los Angeles & Salt Lake Railroad in Los Angeles. For two years he was superintendent of the Arizona & Swansea Railroad at Swansea, Ariz. In 1911 he went to the Pacific Electric Railway as assistant superintendent. Later he was advanced to division superintendent, having served in that capacity during successive years on each of the Pacific Electric's three divisions. In 1913 he was made general superintendent, a position he filled capably until he was made president of the San Diego & Arizona Railroad.

R. S. Neal With The Texas Company

R. S. Neal has resigned as superintendent of equipment of the Kansas City Public Service Company, Kansas City, Mo., to become associated with The Texas Company as electric railway engineer. He will work out of Chicago, Ill. through will work out of Chicago, In. Infough Ohio, Indiana, Illinois, Missouri, Kentucky, and part of Michigan. On March 16, 1918, Mr. Neal joined the Kansas City Power & Light Company in

the way and structures department. was transferred to the board of control on July 16, 1918, as assistant engineer for the July 16, 1918, as assistant engineer for the installation of the Westinghouse stokers in the Missouri River Power Station at Second and Grand. He resigned on May 19, 1919, to go with the Burrell Engineering Company as mechanical engineer in charge

of machinery layout. For a short period he was also assistant engineer of the Witte Engine Works. He returned to the Kansas City Railways on Nov. 12, 1920, to take charge of the engineering work for the mechanical department, organizing the origmal engineering department, which included designing work, making up of specifi-cations, shop work, planning, and general drafting. This position he held until April 1, 1922, when he was appointed assistant superintendent of equipment in charge of the mechanical department. few years later he was appointed superintendent of equipment, in charge of the maintenance of all equipment for the Kansas City Public

Service Company, including the mechanical work at both the shops and divisions. The extensive car rehabilitation program during 1927-1928 was handled under Mr. Neal's administration.

Changes in Interurban Coach

An effort further to co-ordinate genral management of the Mid-West Motor Coach Company and the Shore Line Motor Coach Company has resulted in the appointment of J. C. Johnson, general manager of the Shore Line Motor Coach Company, as general manager of both organizations. F. E. Suyder, manager of the Gary office of the Mid-West Motor Coach Gary office of the Mid-West Motor Coach Company, will retain this position and take up the additional duties of assistant general manager of the Shore Line Company. Henry P. Bruner, Chicago, vice-president of the Mid-West Motor Coach Company, says the two bus lines will continue to operate as separate organizations, without any alteration in policy. No further changes in the management are contemplated. contemplated.

R. H. Horton in Philadelphia **Progress Movement**

R. Harland Horton has resigned as assistant vice-president of operations of Mitten Management to take up his duties as executive director of the Philadelphia progress movement, the purpose of which is

progress movement, the purpose of which is
"to bring greater progress and prosperity
to the city of Philadelphia."

Mr. Horton's immediate task will be to
make a complete survey of all of the industrial advantages of Philadelphia; to collect and organize all of the important facts concerning the city, culturally, insti-tutionally, geographically and socially, and to set forth how desirable a city Philadelto set 10rth now desirable a city Finader-plia is in which to live, to work and to play. An important part of Mr. Horton's responsibilities will be to make the three-year campaign now about to get under way beneficial to the city as a whole, to make it enhance the prestige of the city's present industries and to make it bring present industries and to make it bring new, worthwhile profitable industries to Philadelphia.

Mr. Horton was born in Olean, N. Y., on Aug. 30, 1889. He received his technical education at the Carnegie Institute of Technology. He worked as a rodman for the Pennsylvania Railroad and later had practical experience in the shops of the Carnegie Steel Company. He came to Philadelphia in 1910 to work with a nationally known firm of consulting engineers in the investigation of the Philadelphia Rapid Transit Company for the Pennsylvania State Railroad Commission.

In 1912 he was engaged on further work of P. R. T. investigation and a plan for rehabilitation of the company. When this work was complete he remained in Philadelphia as traffic engineer for P. R. T. and in this capacity made studies of the city's transportation development high-speed with special relation to the Frankford Elevated, and of the company's intangibles in valed, and of the company's intangibles in valuation proceedings. In 1921 he visited the principal cities of the United States to study each city's resources, its industries and its transit problems and methods. The following year he spent three months in Furgre on a similar study. He was his in Europe on a similar study. Upon his return he became vice-president of the return he became vice-president International Railway, Buffalo, under Mitten Management, and held this post until 1925, when he returned to Philadelphia to set up the organization of the Philadelphia Rural Transit Company, operating buses. In 1926 he was made vice-president of the P.R.T. Air Service. In the summer of that year he took part in the conference of air-mail operators with Secretary of Commerce Hoover and subsequently was director of the Air Transport Survey, upon completion of which he returned to Mitten Management as assistant vice-president of operations.

Dean Kimball a McGraw-Hill Director

Prof. Dexter S. Kimball, dean of the College of Engineering of Cornell University, has been elected a member of the board of directors of the McGraw-Hill Publishing Company, publisher of the Electric Railway Journal. Dean Kimball has long been a leader in the field of engineering education and an active con-tributor to the scientific and engineering press. He became a member of the faculty of Cornell as assistant professor of machine design in Sibley College in 1898 and served until 1901. He again joined the Sibley teaching staff in 1904. From July to October, 1918, he was acting president

of Sibley. In 1921, he became dean of the College of Engineering. Professor Kimball is a member of the American Society of Mechanical Engineers and the Society for the Promotion of Engineering Education and the author of several books.

Harold G. Morris in New Providence Post

The board of directors of the United The board of directors of the United Electric Railways, Providence, R. I., at its meeting on July 18 appointed Harold G. Morris assistant general manager. In announcing the appointment First Vice-President and General Manager Williams

"Mr. Morris is one of the outstanding figures in the modernized transportation industry. He is a man of tremendous energy with great ability for organization. Through his appointment the company should benefit greatly as it has in the past



Harold G. Morris

through his associations with it over these years. It greatly pleases me to make the announcement.

Mr. Morris previously held the position of assistant to the general manager. He has been with the United Electric Railways and its predecessors since Aug. 16, 1917. All of this time he has been in the executive offices of the company. At first he was stenographer in the office of A. E. Potter, president, and was later appointed clerk for the receivers of the Rhode Island Company on March 4, 1919, the duties in connection with this office he assumed in addition to the clerical position he held at the time.
In July, 1921, Mr. Morris was promoted

to chief clerk and held that position until Feb. 1, 1929. With the appointment of Alonzo R. Williams to the position of general manager, Mr. Morris again was promoted, this time to the office of assistant to the general manager and assigned tant to the general manager and assigned to Mr. Williams' staff.

On Aug. 1, 1928, Mr. Williams was elected to the position of first vice-president

and general manager and thereupon Mr. Morris' scope of activities became greatly enlarged. He is thirty years of age.

Edward Jacobs Succeeds Captain Hearn at Shreveport

Tacobs has bcen Edward president of the Shreveport Railways, Shreveport, La., succeeding Capt. H. B. Hearn, who has become vice-president of the City Savings Bank Trust Company, Shreveport. He became a member of the staff of the company in 1918. He was elected secretary-treasurer in 1919 and vice-president in 1926.

Duties Reassigned on Indianapolis & Southeastern

W. A. Kirkpatrick, for six years freight agent at Rushville, has been made general freight and passenger agent of Indianapolis & Southeastern Railroad.
J. E. Ray, Indianapolis, who has been superintendent of transportation for the last year, will become head of the traffic department with the title of director of traffic and transportation. J. A. Rothermel and W. A. Patton, both of Indianapolis, formerly in train service, will become division traffic representatives in the reorganization of the traffic department. They will co-operate on both divisions of the railroad to give better freight and passenger service. L. E. Watkins, who has been division traffic representative, at Connersville, Ind., has resigned.

Temporary Appointments at Toronto

Toronto's Council has sustained the Board of Control's recommendation for the appointment of George Wilson, commissioner of finance, and George H. Ross, former commissioner of finance, as members of the Toronto Transportation Commission, in charge of the municipal railway and bus lines, for the balance of the respective terms of the late P. W. Ellis and George Wright, resigned.

C. W. Gifford, general superintendent of the Gary Railways, Gary, Ind., for the last four years, will assume charge of the Des Moines Railway, Des Moines, Ia., on Aug. 1. Before going to Gary, Mr. Gifford was connected with railway systems in the East, among them the Bay State Street Railway, and the Eastern Massachusetts, and the Brockton & Plymouth Street Railway. Under his supervision the operation of one-man cars has been extended over the Gary lines, and considerable additions have been made through incorporation of the Hobart and Valparaiso lines as part of the Gary system. A successor to Mr. Gifford at Gary has not yet been appointed.

Edward P. Warner, formerly assistant secretary of the Navy for Aeronautics, recently elected president of the Society of Automotive Engineers and formerly professor of aeronautical engineering in the Massachusetts Institute of Technology, has been appointed editor of nology, nas been appointed editor of Ariation. Appointment of the former assistant Navy secretary to head the oldest weekly in America devoted to aviation is the latest development to follow recent acquisition of the publication by the McGraw-Hill organization. Mr. Warner, in addition to his duties as editor, will serve as aviation advisor to the company's 26 engineering, industrial and business publications.

Gerard Swope, president of the General Electric Company, has been elected a director of the National City Bank, New York. The election marks the first occasion on which he has associated himself as a director in any enterprise outside the electric and power field and marks also the resumption of an active association between himself and Charles E. Mitchell, chairman of the bank, the

ground work of which was laid more than 30 years ago, when both were in the employ of the Western Electric Company.

Neil Currie, Jr., managing engineer of the motor department of the Pittsfield works of the General Electric Company for the past five years, has been named manager of the Philadelphia works of the company. Robert V. Good, section superintendent in the Schenectady works, has been named assistant to the manager at Philadel-

Charles E. Moore, Jr., since Sept. 1, 1926, junior assistant utilities engineer of the Maryland Public Service mission, has resigned, effective on Aug. 10, to accept a position as planning engineer with the Western Electric Company.

Major R. J. Lockwood, assistant general manager of the St. Louis Public Service Company, was elected president of the Midwest Electric Railway Asso-ciation at the closing session of the three-day meeting at the Chase Hotel, St. Louis, Mo., on June 15.

J. H. Shepherd, engineer and manager of the Dunfermline & District Tramways Company, has been ap-pointed chairman for the ensuing year of the Scottish Tramways & Transport Association. L. Mackinnon, general manager of the Glasgow Corporation Tramways, has been appointed vicechairman

Obituary

John J. Russell

John J. Russell, supervisor of maintenance of way for the Lehigh Valley Transit Company, Allentown, Pa., is dead. Mr. Russell was born in Friendship, N. Y., 70 years ago. As civil engineer for the Erie Railroad he supervised the building of much trackage. He also helped to build the large yards at Salamanca, N. Y., for that company. He also had a part in double-tracking the Erie from Buffalo to Pittsburgh, and assisted in the construction of the Pennsylvania station, in New York City. He next worked with the Interborough Rapid Transit Company in superintending the construction of tracks. He went to Allentown in 1912 to supervise the maintenance of the Philadel-phia division for the Lehigh Valley Transit Company. He was advanced until he exercised supervision over all but the Easton division of the Lehigh Valley.

Samuel M. Perry

Samuel M. Perry, vice-president of the Denver Tramway, Denver, Colo., died on July 21. Mr. Perry was born in Knoxville, Ill., 80 years ago. He went to Colorado in 1887 and in 1890 built an electric railway to Aurora. This line was later merged with the Denver Tramway, Mr. Perry becoming vice-president, a post he held at the time of his death. In 1902 when the Denver & Salt Lake Railroad was built, Mr. Perry became financially interested in the line and opened the Moffat Coal Company at Oak Creek on the rail-road. He was also president of the Moffat Coal Company from its inception until he died He was an enthusiastic sportsman.

John E. Davis

John E. Davis, trainmaster of the South Side Division, Chicago Rapid Transit Company, died in Chicago on June 27, at the age of 67.

Mr. Davis joined the South Side "L" on July 15, 1892, only a few weeks after this first unit of the present Rapid Transit Lines was placed in service. His first duties were as fireman on one of the steam "dinkey" engines then furnishing motive power for elevated trains on what was popularly called the "Alley." Shortly after he was promoted to engineer.

When the power was changed from steam to electricity in 1893, Mr. Davis likewise changed his title from "engineer" to "motorman." He rose through the to "motorman." He rose through the various stages of promotion until his appointment as trainmaster in 1926.

George T. Chaffee, pioneer electric railway owner, manufacturer and banker, died on July 15 in Rutland, Vt. Mr. Chaffee entered the railway business in 1891 as owner of the Rutland Street Railway, then a horse car line. He was instrumental in its change to electricity in 1894, and was prominent in the industry for a number of years. Mr. Chaffee was connected with the F. Chaffee & Sons lumber dealers, and was a part owner of the Patch Wegner Company, machinery manufacturers, and a director of the Glens Falls Machine Company. He had been president of the Rutland Trust Company since 1904, and a director of the Killington National Bank since 1883. He was formerly State Senator.

John M. Sweeney, president of division 308, Amalgamated Association, Chicago, is dead. Mr. Sweeney was born at Belvidere, Ill., on July 3, 1870. He entered the employ of the Chicago Rapid Transit Company on July 13, 1917, as trainman on the south side division. His rise in union circles was rapid, culminating in his election as head of division 308

Louis E. Bean, chairman of the Oregon Public Service Commission, died in Salem, Ore., on July 6, following a heart attack. For nearly three years Mr. Bean had served as a member of the commission and during the last two years had been its chairman.

James G. Murdock, son of the late Samuel T. Murdock, pioneer in inter-urban and power development in Indiana. ana, died recently in Indianapolis. Murdock was born in Lafayette thirty-six years ago. He attended Wabash College and Yale University. He as-sisted in his father's business enterprises until the latter's death some months ago.

Book Reviews

Arc Welding

Lincoln Prize Papers Submitted to the American Society of Mechanical Engineers. Edited by Edward P. Hulse. Published 1929, by McGraw-Hill Book Company, New York City. Cloth, 6x9 in., 421 pages. Price \$5.

Last year prizes aggregating \$17,500 were awarded for the best three papers disclosing advancement in the art of electric arc welding. While these were financed by the Lincoln Electric Company, the contest was sponsored by the American Society of Mechanical Engineers and the awards were made by a disinterested committee of eight prominent engineers. This book, composed of the three prize papers, of two receiving honorable mention and two others of the 77 submitted, is ample evidence that the incentive was adequate. is easily the most important contribution

yet made to the literature of arc welding.
"Arc-Welding—Its Fundamentals and
Economics," brought the first prize of
\$10,000 to James W. Owens. It reflects the author's extensive experience as director of welding for the Newport News Shipbuilding & Drydock Company, but he finds ample space in the 180 pages of his paper for the fundamental treatment of arc welding in general. The attention given to definitions, nomenclature, standards and specifications, and the author's definitely practical viewpoint throughout, add much

to the value of the paper.

"Fundamental Principles of Arc Welding," for which Prof. H. Dustin of Brussels, Belgium, received second prize of \$5,000, proceeds from systematic analysis and tests of the elementary welds to an experimental study of joints for structural work. His conclusions are general in their application.

Commander H. E. Rossell of the U.S. Naval Academy, who won third prize of \$2,500 with his paper "Electric Welding of Ships' Bulkheads and Similar Plated Structures," makes a distinct contribution to the science and art of naval architecture. Incidentally he adds definitely to structural knowledge in general.

It is not generally realized that newly developed types of expansion joints make welding as applicable to the unpaved tracks of steam railways and interurban electric roads as to the paved tracks of street railways. The field for welded rail joints is therefore very large. In his paper on the "Theory and Application of the Base Plate Arc Welded Rail Joint," Frank B. Walker, Chief engineer Fastery Massachusetts chief engineer Eastern Massachusetts Street Railway, outlines extensive tests of rail joints in laboratory and field and gives designs and cost figures for commercial applications.

"Stable Arc Welding on Long-Distance Pipe Lines," by B. K. Smith, president of the Big Three Welding & Equipment Company, is mainly a brief history (with costs) of the laying of 45 miles of arc-welded

pipe line for natural gas.

"Arc Welding as applied to Constructive Work at the Philadelphia Navy Yard" describes the construction of a steel pressure-resisting boiler test room and experisure-resisting boiler test room and experiments on the welding of T bars to armor plate. The authors are M. M. Kennedy and F. H. Wieland of the Philadelphia Navy Yard.

In "Arc Welding of Duplicate Structures," W. G. Hines describes methods used in the publication of interchargeable.

used in the publication of interchangeable arc-welded truck-switch frames.

Undoubtedly these papers, particularly the three prize papers, add much to our practical knowledge of the rapidly developing art of arc welding.

Industry Market and Trade News

Increased Activity in Car Buying

E STIMATES made early in the year in the Annual Statistical issue of this paper to the effect that 1929 would be marked by heavier purchases of rolling stock than have been made for several years past have been confirmed within the past 30 days by authorizations which should lead to the placing of orders for more than 650 new cars by properties in this country and Canada.

As the result of the recent merger of the Brooklyn City Railroad with surface lines of the Brooklyn-Manhattan Transit Corporation into a new organization to be known as the Brooklyn & Queens Transit Corporation, the immediate purchase of 100 new cars has been authorized. While complete specifications are not available at this time it is announced that the new cars will be provided with high acceleration motors, special brakes, and other modern equipment, to insure the safety and comfort of the passengers as well as to maintain high speed operation under present day traffic conditions. They will be of the front entrance, center exit type, with seats for 50 passengers and equipped for one-man operation. It is estimated that the new cars will cost in excess of \$15,-

The approaching completion of the new subway system being developed under the direction of the Board of Transportation of the City of New York has led the authorities to ask for the submission by manufacturers of scaled proposals for the construction and de-livery of 300 steel passenger ears. Bids must be in the hands of the Board at its office, 49 Lafayette Street, New York City, not later than August 20. For more than a year engineers of the board, aided by experts in car construction and design, have been studying the problem, with the result that the new cars will be faster and more commodious than any

now in use in the city.

Preliminary specifications call for cars 60 ft. 6 in. in length, 10 ft. wide and 12 ft. high, with four double doors on each side. While the seating arrangement will be similar to that of the present B.-M. T. cars an attempt will be made to achieve greater passenger comfort by allowing more knee room. Each car

will seat 60 passengers.

Authority has been granted by the Cleveland City Council to the Cleveland Railway to purchase 100 new street cars at an estimated cost of \$1,800,000. The company had requested permission to retire 254 cars of an older type, replacing them with new equipment, but the Council would only consider the retirement of 100 at this time. It is understood that the cars will be of the single end, double truck, one-man, two-man, Peter Witt type, similar to the 50 cars ordered in 1928 from the G. C. Kuhlman Car Company. The cars previously supplied are 53 ft. 6½ in. in length, weigh 44,800 lb., and seat 55 passengers. Bodies are of semi-steel construction, with arch roofs, and doors at both center and end,

Following experimental operation extending over a period of several weeks with one of the small type of Brill standardized car, the Lynchburg Traction & Light Company, Lynchburg, Va., has placed an order with that company for twenty double-end, double-truck The new cars, which are ordered for city service, will be equipped with four motors, and will have an over-all length of 43 ft. 3 in., and will seat 50 passengers. Of more than usual significance is the fact that the cars are being purchased in accordance with builders'

With the appointment of two additional members on the board of the Commission. Toronto Transportation raising that body to its full quota, there would appear to be removed the last obstacle to the placing of an order for 55 motor cars and 55 trail cars for that property, recommendations for which have been pending for several months. Specifications have been agreed upon and bids have been submitted by several Canadian manufacturers of ear bodies and supplies, consequently prompt action can follow any proper authorization from the commission.

According to preliminary specifications each motor ear and trailer will form a two-car train, the motor cars to be provided with four motors each and the trailers with two. By the provision of auxiliary switching control it will be possible to move the trail cars around the earhouses under their own power. In general the cars will resemble the Peter Witt cars now being operated by the commission, with the exception that the new cars will be 50 ft. in length over all, with seats for 56 passengers, as compared with an over-all length of 52 ft. and a seating capacity of 60 passengers in the present standard equipment. The new trailers will seat 52 passengers each, the same as the present trailers. Cost of the new rolling stock and its equipment is expected to total in excess of \$1,500,000.

Another Canadian order conditional upon the adjustment of certain franchise legislation, which now appears to have been satisfactorily disposed of, is that of the British Columbia Electric Railway, Vancouver, B. C., for fifteen cars of the one-man two-man front entrance, center exit type, similar to certain cars recently ordered for Cleveland and Toronto. ordered for Cleveland and Toronto. Total cost of the new ears will exceed \$300,000.

Lehigh Valley Considering Electrification

Engineering surveys recently have been made of a 75-mile section of the Lehigh Valley Railroad, extending from Mauch Chunk to Wilkes-Barre, with the view of its possible electrification. The estimated cost of the project is placed at between \$7,000,000 and \$10,000,000. The section under consideration runs through mountain territory, and the management believes that electrification would permit the movement of heavier trains at greater speed than is now possible with steam. It is thought that the maintenance cost of

electric locomotives would be considerably below that of steam equipment. relative advantages of direct and alternating current arc under consideration, as well as the question of voltage. Lehigh Valley officials are also making a close study to determine whether the use of more powerful steam locomotives would compensate for the advantages promised by electrification.

Recent Bus Orders Numerous

Electric railways continued to be the dominant factor in the bus field during the past month by placing numerous orders for new automotive equipment. there were no exceptionally large purchases the orders were widely representative and the aggregate was considerable. By the purchase of nine 40-passenger Twin Coaches, the Boston Elevated Railway increased its fleet of these vehicles to 35.

Other purchasers of Twin Coaches were the Sayannah Electric Company, The Burlington Rapid Transit Company, Burlington, Vt., and the Milwaukee Electric Railway & Light Company, each of which has bought five. The Capital Traction Company, Washington, D. C., and the Philadelphia & West Chester Railway have ordered eleven and three units respectively. The New Orleans Public Service, Inc., has placed an order with the Twin Coach Corporation for one 42-passenger trackless trolley, to be equipped with 50-hp. motors. An order for eleven trackless trolleys has also been placed with the Twin Coach Cor-

also been placed with the Twin Coach corporation by the Utah Light & Traction Company, of Salt Lake City.

The American Car & Foundry Motors Company reports the delivery of two 29-passenger parlor coaches to the Southern Michigan Transportation Company, of Jackson, Mich., three 29-passenger full Michigan Transportation Company, of Jackson, Mich., three 29-passenger full headroom parlor coaches to the Motor Transit Corporation, Chicago, Ill., and an analysis of the company of three 21order of five 27-passenger and three 21-passenger parlor coaches to the Baltimore Coach Company, all electric railway sub-

sidiaries.

The Indianapolis & Southeastern Rail-road, of Indianapolis, Ind., has purchased four 22-passenger parlor observation cars from the Studebaker Corporation. Other Studebaker sales reported include seven 21-passenger buses of the de luxe street car type to the Eastern Massachusetts Street Railway, Boston, Mass., two 21passenger street car type buses to the Fitchburg & Leominster Street Railway, Fitchburg, Mass., and one 21-passenger street car type bus to the Austin Street Railway, Austin, Tex.

Mack-International Motor Truck Corporation reports the sale of eighteen model AB four cylinder chassis to the Rochester Railways Co-ordinated Bus Lines, Rochester, N. Y., four six-cylinder model BK chassis to the Rochester Interurban Bus Company, and one six-cylinder model BK Company, and one six-cylinder model BK chassis to the Syracuse Railways Coordinated Bus Lines, Syracuse, N. Y. The three companies are all affiliated with the New York State Railways. Two six-cylinder model BK buses have also been delivered to the Boston, Worcester & New York Street Railway, Framingham, Mass. Recent deliveries of the General Motors Truck, Company, include twenty-five type.

Truck Company include twenty-five type

Z-29 city service buses to the Department Z-29 city service buses to the Department of Street Railways, City of Detroit, ten type W city service coaches to the Illinois Power & Light Corporation, six for Quincy and four for Galesburg, and two type Z-39 coaches to Coast Cities Railways, of Asbury Park, N. J. London Street Railway, of London, Ontario, has received five type W city service buses. Fifth Avenue Coach Company, of New York City, has taken delivery of eleven York City, has taken delivery of eleven yellow coaches—five of the type W observation type, five type W's and one Z-240.

In addition to an order of eighteen Mack buses recorded above the Rochester Railways Co-ordinated Bus Lines, Rochester, N. Y., has also received ten White model 54-A six-cylinder buses. Other deliveries by the White Company include three model 50-B buses to the Alabama Power. Company, Birmingham, Ala., fourteen model 54 buses to United Electric Railways of Providence, and six model 54 buses to the Penn-Ohio System, Youngstown, Ohio.

New Gas-Electric Bus by St. Louis Car Company

Tests have recently been completed by the St. Louis Car Company on a new type of gas-electric bus on which its engineering staff has been working for more than two years. The new vehicle will seat 40 passengers.

The gas-electric power unit is located in the rear end. It consists of a six-cylinder gasoline engine direct connected to a d.c. generator. The power is used in four 30-hp. motors, one geared to each of the rear wheels.

The tests show that the bus will attain a maximum speed of 45 m.p.h. From a standstill it will accelerate to a speed of 20 m.p.h. in eleven seconds. Dynamic braking is used, being controlled by a pedal, the rate of braking depending on the distance the pedal is depressed.

The doors are interlocked with the con-

trol, so that the bus cannot move unless all doors are closed. They are opened by push-button control, with a treadle for the exit door at the center of the vehicle. The main control has a dead-man safety feature which unlocks the doors and sets the dynamic brakes and automatically reduces the speed to not more than 2.5 m.p.h. on a steep down grade.

The bus is low hung, the floor being

26 in. from the ground and the step 13 in. The wheelbase is 210 in. The over-all dimensions of the bus are: length, 31 ft. 4 in.; width, 8 ft., and height, 8 ft. 11 in.

The bus was on display at the convention of the Electric Railway Association of Equipment Men, Southern Properties, being held at Lexington, Ky., on July 24-26. Following this it is planned to exhibit it at Louisville, Indianapolis and Terre Haute.

Brill Brings Out a Trolley Bus

A trolley bus, developed by the J. G. Brill Company, made its initial appearance at the recent convention of the Mid-West Electric Railway Association held in St. Louis. Through the use of alumiin St. Louis. Through the use of aluminum alloy in body and fixtures the weight of the unit is kept down to approximately 14,500 lb. The side windows are fitted with single sash, with counterbalance spring. Circulating passenger load is accomplished by the provision of a rear exit door, pneumatically operated under control of the driver. Included in the equipment are four-wheel positive acting in-

ternal expanding air brakes, an emergency disk parking brake, pneumatic windshield wipers, cam and lever type steering mechanism designed expressly for balloon tires, two G. E. 35-hp. high speed motors, and PCM foot control. Seating capacity is provided for 30 passengers. Claims made for the new unit include economical power consumption, quick and smooth ac-celeration, noise reduction, flexibility in traffic and exceptional riding comfort.

Ohio Brass Entertains Electrification Engineers

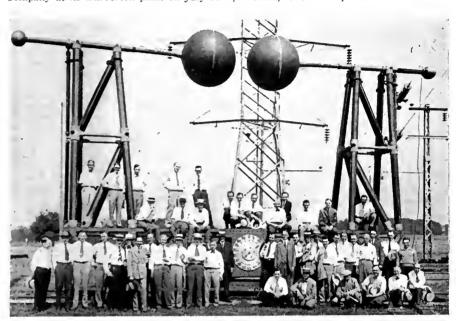
Electrical engineers of many of the leading steam railroads that have electrified divisions or are contemplating electrification were the guests of the Ohio Brass Company at its Barberton plant on July 11

Gear Inspection Standardized

The proposed American recommended "Inspection of Gears" has been completed by one of the sub-committees of the sectional committee on the standardization of gears. Copies of this proposed standard are now being widely distributed for criticism and comment. It is in tentative form for discussion, and criticisms should be mailed to C. B. LePage, assistant secretary American Society of Mechanical Engineers, 29 West 39th Street, New York,

N. Y.

This proposed practice covering the inspection of worms, hobs and cutters was developed by sub-committee No. 9, consisting of 31 men representing manufacturers, consumers and general interests, in conjunction with a committee of the American Gear Manufacturers' Association. As here presented, it is a composite of several sec-



Steam railroad electrification men inspect high-tension laboratory of Ohio Brass Company at Barberton

and 12. The two-day session was devoted to a study of problems of high-tension insulator design and catenary overhead construction, with special reference to insulation.

The party inspected the insulator plant and saw the various manufacturing processes in the making of electrical porcelain. The indoor laboratory was then visited and a number of breakdown tests witnessed. The equipment includes a 750,000-volt transformer with a capacity of 750 kva. The transformer is excited by a special sine wave generator which is attached to the transformer case and is driven by a motor through an insulated shaft.

In the afternoon, tests were made at the outdoor laboratory, which is equipped with a set of similar generators that will deliver 3,000,000 volts at 25 or 60 cycles. Tests were made at normal frequency, as well as impulse tests using steep wave fronts, simulating lightning. Equipment for photographing the discharge in daylight

was demonstrated.

In the evening and on Friday morning a discussion was held on means of obtain-ing reliability in catenary and transmis-sion insulation. Various types of insulation were discussed and some were demonstrated at the evening session. tests in the indoor and outdoor laboratories were made on Friday afternoon.

tions on the subject as developed and approved as "Recommended Practice" of the A.G.M.A.

Bender Body Increases Capacity

Through additions to and rearrangement of the present plant the Bender Body Company, Cleveland, Ohio, plans a 30 per cent greater production of Bender bodies in the near future.

Work is already under way on a new building to serve for final assembly purposes. This structure is 163 ft. x 100 ft., of brick and steel with walls chiefly of glass, also monitor glass roof, assuring a maximum daylight.

A 150 ft. x 80 ft., addition to the castern end of the present building will be used for the paint shop. It will contain the latest type spray booths and other modern developments.

Wagner Electric Corporation, St. Louis, Mo., announces the addition of W. H. Kretz to its transformer sales division. Mr. Kretz will travel the Southwest. He was formerly with the Public Service Company of Oklahoma and more recently has been Texas district representative for the Jeffry De trict representative for the Jeffry De Witt Insulator Company.

New Cars of Montreal Tramways

Details of 106 new cars recently completed for the Montreal Tramways, Montreal, Canada, by the Canadian Car & Foundry Company, announcement of which was made in the July issue of ELECTRIC RAILWAY JOURNAL, are now available. The order consisted of 60 single-end two-man cars, scating 42 passengers; 40 single-end one-man cars, seating 40 passengers, and six double-end one-man cars seating 40 passengers, all provided with P.A.Y.E. features and all designed for city service.

The 60 two-man cars have an over-all length of 46 ft. 2 in., with bolster centers spaced 22 ft. 7 in., and length over the body posts of 31 ft. 4 in. The weight of the car body is 16,000 lb., trncks, 10,000 lb., and equipment, 9,900 lb. The 40 one-man cars and the six double-end cars have somewhat smaller dimensions, being 41 ft. 2 in. in length over all, with a length of body of 26 ft. 4 in., and with bolster centers spaced 17 ft. 7 in. The double-end cars are slightly heavier, with a total weight of 38,100 lb., as compared with 35,250 lb. for the 40-seat single-end cars. All three are of semi-steel construction with arch roofs. All have an over-all width of 8 ft. 5 in., and height, rail to trolley base, of 11 ft., and are provided with trucks with 5-ft. 4-in. wheelbase. Detailed equipment specifications, which are substantially the same for all three types, are as follows:

Geara and pinionsNuttall, grade B. P.
Class Plate 71 oz. double unick
Hand brakes Peacock staffless
Hand hol a Rigid wood rail on aluminum brackets
Heat insulating materialThree-ply Salamander
HeatersCanadian General Electric Company
Gelevi id Delter Heller the most stic control
Calrod with Railway Utility thermostatic control
Headlining å in. Agasote
Interior trim
Journal bearingsPlain bronze, babbitt lined
Journal boxes Cast iron, Montr al tramways,
standard
Lamp fixtures. Electric Service Supplies, compensat-
ing salety dome nxture
Motors our Westinghouse 510-A2, inside hung
Painting scheme, M. T. Co. standard green and cream
Roof type
Roof material Wood and canvas
Safety car devices Door and power interlock
dead man handle
Sash fixtures Robt. Mitchell Co Montreal
Seata. Ottawa Car Mfg. Company and Canadian
Seat anacing30 in.
Seating material
Slack adjustera. American Brake Company, Type E
StepsIrving Subway Company, folding
Step treads
Trolley catchera
70 . 11
Trolley wheels
Trolley wheels
Trucks, Canadian Car & Foundry Company, F-790 VentilatoraRailway Utility Company
ventuatoraRanway utility Company
Wheela
Wheelguards or fendera

Maria II. and do B. D

Montreal Tramways has also placed an order for 25 two-car trains, each unit of which will be almost identical in construction with the standard single-end two-man cars described above, with the exception of the additional reinforcing made necessary to support the couplers. Full details of these cars are not available at this time, as motor equipments have not been determined.

Copperweld Steel Company, Glassport, Pa., announces the establishment of a northeastern district under the management of George F, Bain. The northeastern district includes all of the New England states and all of New York State north of Westchester and Rockland Counties. Mr. Bain's headquarters will be at 30 Church Street, New York City. Paul Van Wagner is now district manager for Greater New York City and for New Jersey, Pennsylvania and West Virginia.

F. L. Markham Advanced by Brill Company

F. L. Markham, identified with the Brill organization for 25 years, has been appointed sales manager of the American Car Company, St. Louis. In this capacity he succeeds the late Wirt L. Haymond. Mr. Markham started his career as a car salesman on July 15, 1904. On that date he joined the sales force of The J. G. Brill Company and was assigned to the Southern territory,



F. L. Markham

comprising nine states. Later he organized the Railway Supply & Equipment Company, with headquarters in Atlanta, Ga., which organization handled the sale of Brill cars, trucks, seats, etc., until September, 1918, when Mr. Markham joined the sales department of the American Car Company, the Brill associate plant in St. Louis. His recent appointment, therefore, is the culmination of eleven years of active service with the sales force of the American Car Company, of which he now becomes sales manager.

Johns-Manville Corporation, New York, has issued a 24-page illustrated circular entitled "Celite for Concrete." Celite, a product recently added to the company's line, is a specially prepared grade of diatomaceous silica which is said to improve the workability of concrete mixture, and at the same time to afford a maximum of water-tightness.

Lincoln Electric Company, Cleveland, Ohio, manufacturers of motors and arc welders, announces the appointment of B. W. Brown as district sales representative with headquarters at Milwaukee, Wis. G. O. Forseth, formerly sales representative at Detroit, has been promoted to sales representative at Minneapolis.

L. G. Avery, manager of the sales promotion department of the White Company since 1926, has been promoted to the managership of the Detroit district. Walter A. Maynard, White Company transportation engineer, has been appointed sales promotion manager. Mr. Avery goes to Detroit with seventeen years experience in automotive merchandising. Mr. Maynard has covered the country in the study of bus transportation and as manager of vocational sales promotion. He joined White in 1923. In the development of vocational sales he has become an authority on bus transportation and on warehousing and distributing operations.

ELECTRIC RAILWAY MATERIAL PRICES—JULY, 1929

July 10 in the control of the contro								
Metals-New York	Paints. Putty and Glass-New York							
Lead, cents per lb Nickel, cents per lbingot Zinc. cents per lb Tin, Straits, cents per lb Aluminum, 98 to 99 per cent, cents per lb	18, 6,75 35, 7,15 47,375 24,30	Linseed oil (5 bbl. lots), cents per lb	12.9 13.2 \$0.57 5 725					
Babbitt metal, warehouse, cents per lb.: Commercial grade General service Bituminous Coal	62 00 45,00	Copper wire, cents per lb	19 875 6 85 20 875					
Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons	\$4 17	Paving Materials						
Somerset mine run. I.o.b. mines, net ton Pittsburgh mine run, Pittsburgh, net ton Franklin, Ill., screenings, Chicago Central, Ill., screenings, Chicago Kansas orushed mine run, Kansas City	1 82 1 00 1 75 1 25 2 50	Paving stone, granite, 5 in., f.o.b. New York—Grade I, per thousand Wood block paving 31, 16 lb. treatment, N. Y., per sq.yd, f.o.b, Paving brick 31,81,24, N. Y., per 1,000 in	\$150 2.70					
Track Materials-Pittsburgh	carload lots, f.o.b	51.00						
•	\$43.00 2.80 2.15 2.75 3.90 1.95 \$1,40	Paving brick 3x84x4, N. Y., per 1,000 in carload lots, fo.b. Crushed stone, ½-in carload lots, N. Y., per cu.yd, delivered. Cement, Chicago consumers' net prices, with ut bags, fo.b. Gravel, ½-in., cu.yd., delivered. Sand. cu.yd., delivered.	45.00 3.25 2.05 3.25 2.00					
Hardware—Pittsburgh		Old Metals-New York and Chi-	cago					
Wire nails, base per keg Sheet iron (24 gage), cents per lb Sheet iron, galvanized (24 gage), cents per lb Galvanized barbed wire, cents per lb Galvanized wire, ordinary, cents per lb Waste—New York	\$2 70 2 90 3 60 3 35 3 15	Heavy copper, cents per lb Light copper, cents per lb. Heavy yellow brass, cents per lb. Zinc, old scrap, cents per lb. Lead, cents per lb. Lead, cents per lb. Steel car axles, Chicago, net ton.	14 375 12.375 8.125 3 15 4 75 \$16 75					
Waste, wool, cents per lb.: Waste, cotton (100 lb. bale), cents per lb.: White Colored	13. 12.5 9.5	Castiron car wheels, Chicago, gross ton Rails (short), Chicago, gross ton Rails (relaying), Chicago, gross ton (65 lb. and heavier). Machine turnings, Chicago, gross ton	14. 25 18. 25 28. 50 7. 75					

The Morale of your Men is PARAMOUNT

Your motormen have to make schedules.

Can they do it unless they operate with the assurance that in the emergency they have brakes that will hold?

If they have not, they are working under a handicap.

But with a 72 lb. Peacock Staffless Brake that takes up a minimum of platform space they have at their command 3000 lbs. of braking power regardless of condition of brake shoes.

This is something to think about, isn't it?



National Brake Company, Inc.

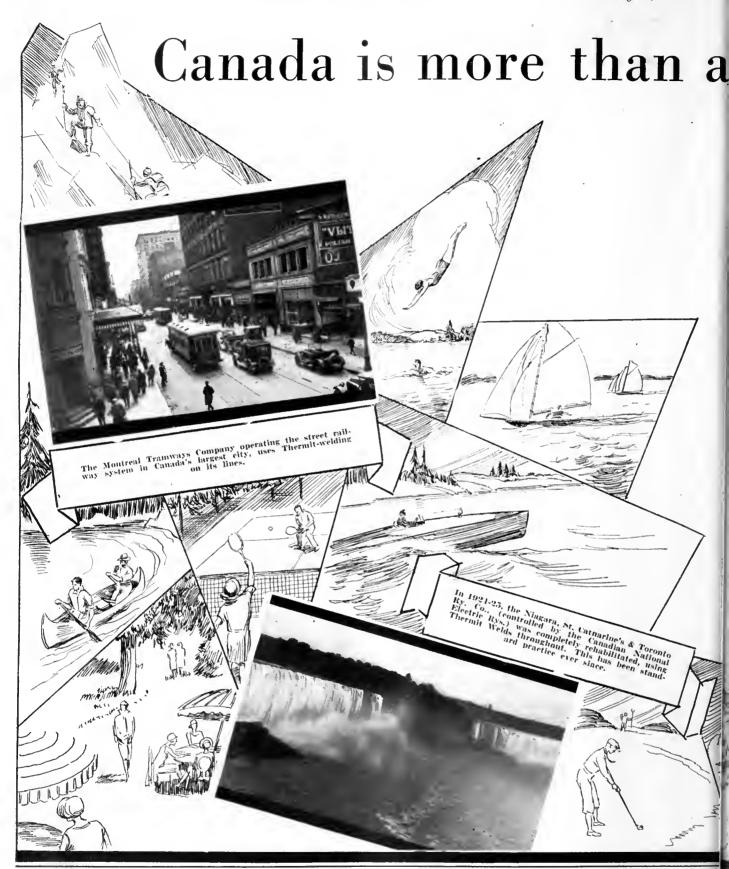
890 Ellicott Square

Buffalo, N. Y.

Conodion Representative

Lyman Tube & Supply Co., Ltd., Montreal, Can.

The Ellcon Company—General Sales Representatives
50 Church St., New York



METAL & THERMIT

summer vacation land

It is a country of almost boundless natural resources.

It is a country of immense industrial possibilities, the development of which is proceeding apace.

Canada's leading cities combine great historic interest with a thoroughly modern and progressive spirit of development. Their transportation systems are modernized—both in equipment and maintenance practice.

Thermit-welding has as firmly established itself on most of the electric railways in Canada, as on the leading systems in the States.

Thermit-Welding Of Rails is Found In These Well-Known Canadian Cities

MONTREAL — WINDSOR — WINNIPEG NIAGARA FALLS — ST. CATHARINE'S EDMONTON

And also the year 1929 sees initial Thermit installations in Toronto, Saskatoon and Guelph,

Thermit-welding is accepted, for its permanence, for its freedom from maintenance requirements, and for the quiet smooth-riding qualities which it gives to the track.







LOWER MAINTE





The Cities Service Grease Gun

Weighs 185 pounds.

Holds 85 pounds of grease.

Mounted on 4-wheel truck.

Operated by air, using 3 cubic feet of air per minute in continual operation.

Portable, with an operating radius of a 100 foot circle.

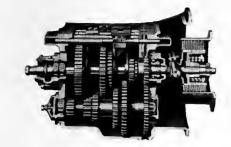
Designed to operate on the air supply generally found in bus shops.

Gun is entirely automatic with opening and closing of control valve. Stops when grease is not actually flowing.

On 150 pounds of air, it is capable of delivering grease under 5000 pounds' pressure at the nozzle.

Delivers 2 pounds of free grease per minute. Handles the heaviest types of grease.

Is extremely simple and capable of continual use without repairs.



Cities Service Company understands the problems of bus owners because it has had bus problems of its own. Several of its subsidiaries are transportation companies, operating fleets of buses. Cities Service brought its 67 years of experience in the oil business to the solution of their lubrication problems—and it offers you the benefit of this experience.

NANCE COSTS

... for chassis, transmission and differential . . .

Buses receive as much shock and as many chassis strains in a year as the average passenger car experiences in its whole existence. Most of this is unavoidable but the extra strain and shock due to faulty lubrication costs bus owners millions of dollars yearly.

To take proper care of universal joints, shackles, etc., and to cope with the heat condition of wheel bearings, Cities Service developed Koolmotor Universal

Grease,—made from high grade heavy cylinder stock—a superior grease which prevents metal to metal contact and stays in wheel bearings without leaking or allowing free oil to run.

Koolmotor Universal Grease is made in medium, heavy, and extra heavy bodies to meet all requirements. It is the correct complete chassis lubrication. Used with the Cities Service Grease Gun it is easy to apply.

Oil Division

CITIES SERVICE COMPANY

60 WALL STREET, NEW YORK CITY

KOOLMOTOR PRODUCTS

STRUCTURAL STEEL

Fabricated Steel Structures

for every purpose



Progress Picture, Power Station

Fabricated Structural Steel by

American Bridge Company

Subsidiary of United States Steel Corporation

Manufacturers of STEEL STRUCTURES of all classes, particularly

BRIDGES AND BUILDINGS

Roof Trusses, Columns, Girders, Towers and Poles, etc.

General Office 71 BROADWAY, NEW YORK, N. Y.

Contracting Offices in Principal Cities

FUNDAMENTAL SUPERIORITIES

THAT ONLY . .
THE WORLD'S
LARGEST . .
PRODUCER . .
OF RUBBER . .
CAN BUILD . .

INTO A



HEAVY SERVICE TIRE

Trucks and buses all over America are daily demonstrating the fundamental superiorities of U. S. Heavy Service Tires. Purer, tougher virgin rubber from our own plantations, unimpaired by repeated workings and chemical processes, is the basis of these superiorities. Exclusive technical processes, which we developed ourselves, put thousands of extra miles into the heavily reinforced side walls and the thicker, tougher treads



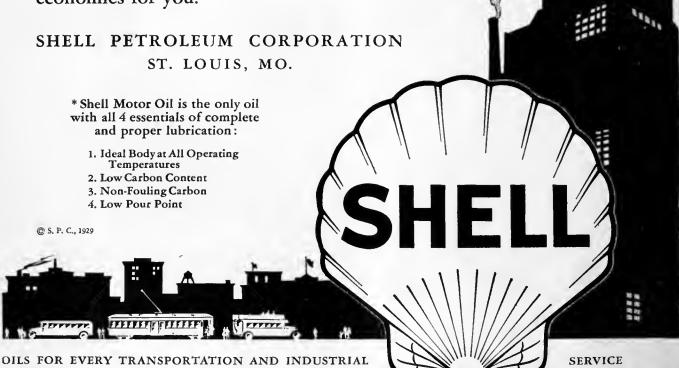
UNITED STATES RUBBER COMPANY

HE DIFFERENCE between the Shell principle of lubrication and ordinary practice is the difference between "custom-made" and "ready-made."

Vast resources and facilities enable Shell to follow this principle with equal vigor in the refining of oils for both transportation and industrial service.

Shell Motor Oil* is made in a grade for every bus, truck and passenger car. Shell Industrial Oils are exactly suited to the specific lubrication requirements for which they are prescribed.

Talking over your needs with a Shell Lubrication Engineer when he calls places you under no obligation and more than likely will result in measurable operating economies for you.



BACKEROUND

WHY should not men have flown years and years ago?

What made the telegraph, the telephone, the electric light and the automobile and radio such laggards?

The lack of associated experiences and an undeveloped belief of necessity in the human mind!

So in the motor coach field it is not just RAW horsepower you are seeking; not the mere revamping of what has been custom.

Look for Background!





FRANK R. FAGEOL

Who has sponsored most of the universally conceded advances in motor coach art since its inception.

WILLIAM B. FAGEOL

Whose work in building chassis and body integral reduced coach weight and revolutionized design.

PAUL H. BREHM

His background in the field maintenance of thousands of motor coaches produced Twin Coach simplicity of upkeep.



"Skipper, those fellows are showing this industry how to handle mass transportation—without rails"—the prediction of more than one motor coach operator.



FOREGROUND

WHEN bus operation is more seriously countenanced by the members of the A. E. R. A. and its maintenance given the same concentration of thought as trolley car maintenance, the present scope of coach operation will dwarf into insignificance compared to that of the future.

Already there is a *changing mentality* in the ranks of the urban operators. You will hear echoes of it at Atlantic City this fall.







Seat That Will Stand Abuse.

Here is an ideal seat for your bus equipment. It is a high back, all leather chair, with a selecied hardwood frame accurately joined and reinforced at all vital points by malleable iron braces. The 55 P Special will stand the hard usage which every bus chair is bound to receive, yet it is extraordinarily comfortable. It has spring-filled cushions over our deep, built-up spring construction and individual, spring-filled backs. The 55 P Special is mounted on double-clawed, malleable iron legs equipped with heavy rubber shock absorbers. Ask the nearest H-W sales office about this and many more of our modern, practical bus and railway seats.

HEYWOOD - WAKEFIELD COMPANY



516 West 34th St., New York City J. R. Hayward, Liberty Trust Bldg., Roanoke, Va. H. G. Cook, Hobart Bldg., San Francisco, Calif. 439 Railway Exchange Bldg., Chicago, Ill. A. W. Arlin, Delta Bldg., Los Angeles, Calif. The G. F. Cotter Supply Co., Houston, Texas

The Railway and Power Engineering Corporation 133 Eastern Ave., Toronto; Montreal; Winnipeg, Canada



If you have not received a copy of our new Bus Seat Catalogue, write for it.



A prophecy of 1899

The Passing of the Horse

A ramous cartoon by Homer Davenport appearing in the New York Journal in 1899. Reprinted by permission of King Features Syndicate, Inc.

AMERICAN BROWN BOYERI

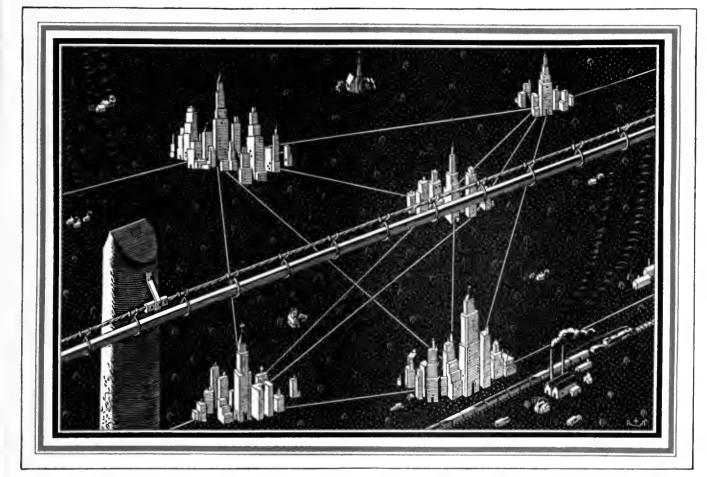
And a prophecy of 1929



AMERICAN BROWN BOVERI CO., INC. CAMDEN, N. J.



How Easy it is to Telephone between Cities



Whether it is a call to the next block or to another city, the telephone instrument on your desk is always ready. And it is easy to use. On calls to nearby cities, the operator will usually get the wanted telephone while you hold the line.

The simple act of using the telephone is often more effective than a trip in person. The representative of a Richmond grain company traveled 100 miles several times to call personally on a buyer without success. Then he called him by telephone—and sold him a carload of wheat. Cost of the call, 70c.

An Atlanta commission house started 10 carloads of potatoes across from Memphis. While the cars were rolling, 9 of them were sold by telephone in towns along the way. The last car was sold by telephone in Atlanta. Sales, \$10,000. Cost of calls, \$5.45.

The telephone habit is good for business men in every line. It is so convenient. What calls could you profitably make to other cities now?

Calling by number takes less time. Bell Telephone Service is *Convenient* *Economical* *Universal*.

5 Out of 7

Regularly use "Tool Steel" Gears and Pinions

Entries for the Coffin Prize

Up to noon of July 1, the following entries have been received for the Charles A. Coffin Prize:

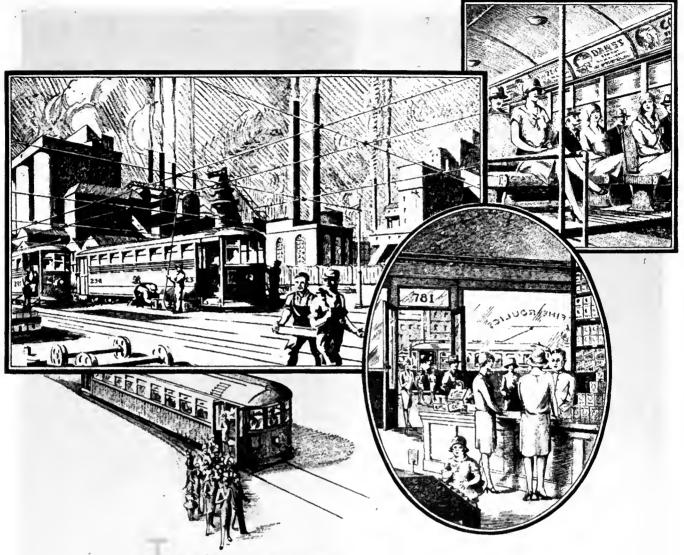
El Paso Electric Company, El Paso, Tex.
Houston Electric Company, Houston, Tex.
Northern Texas Traction Company, Fort Worth, Tex.
Chicago, South Shore & South Bend Railroad, Michigan City, Ind.
Department of Street Railways, Detroit, Mich.
Community Traction Company, Toledo, Ohio
Pennsylvania-Ohio Electric Company, Youngstown, Ohio

A E R A-July, 1929

It's the same story, every time you check the "live wires" of the industry, no matter what the basis for selecting the group—the majority use "Tool Steel" gears—They know it pays to buy the best.

Tool Steel Gear & Pinion Co. Cincinnati, Ohio



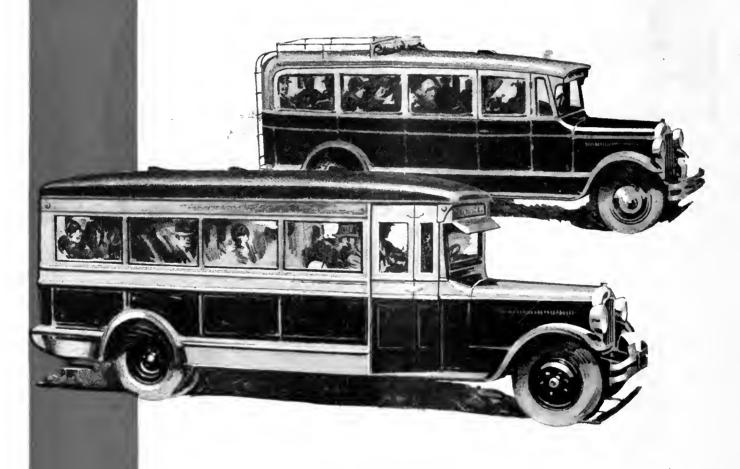


he Electric Railway is an outlet of the power, machinery, car building, and other industries. It works for all of them. But its greatest service is to the riding public. Likewise where advertising promotes many interests, its chief function is its service to the consuming public. To long survive, any business must convey its benefits to the ultimate consumer.

BARRON G. COLLIER INC.

NEW · YORK · CITY

The headway you you you seek, the for





SOLD AND SERVICED BY

want, the patronage low cost you need profitable operation

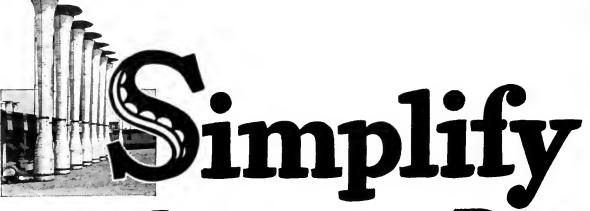
HUNDREDS of operators have found a way to insure themselves of profitable motor coach operation They are putting Dodge Motor Coaches to work with the definite assurance that with these modern coaches they are able to decrease headway, gain patronage and obtain more revenue.

The practical size of Dodge Coaches—21-passenger capacity in the Street Car Coach and 16-passenger capacity in the Parlor Coach—plus their speed, acceleration and dependability, permit of greater frequency of service. Their comfort, safety and fine appearance attract and hold patronage. Their economy, in both operation and maintenance, results in low cost per mile, per trip or per passenger.

It will pay you to investigate Dodge Motor Coaches Your investment will be a wise one—no matter what route you put them on.

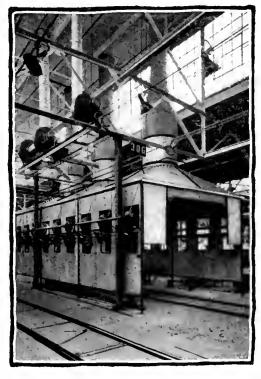
BROTHERS

DODGE BROTHERS DEALERS EVERYWHERE



your Maintenance Problem with These Facilities

Spray painting equipment in railroad paint shops offers a definite solution for one of the greatest time consuming maintenance operations. ¶With proper facilities and the use of Duco, or similar fast drying finishes, painting costs on street cars and motor buses can be reduced 50% . . . and spray painting gives you a finer finish with much longer life. ¶Mahon engineers will cooperate in the arrangement of paint shops and the design of Spray



Booths best fitted to individual requirements and existing conditions. These Spray Booth specialists, backed by years of experience involving hundreds of Spray Booth installations throughout the United States and Canada, are available to you, and will gladly make detailed recommendations. Do not hesitate to call on them . . . consultation with this staff of highly specialized Spray Booth experts places you under no obligation. Write today.

THE R. C. MAHON COMPANY

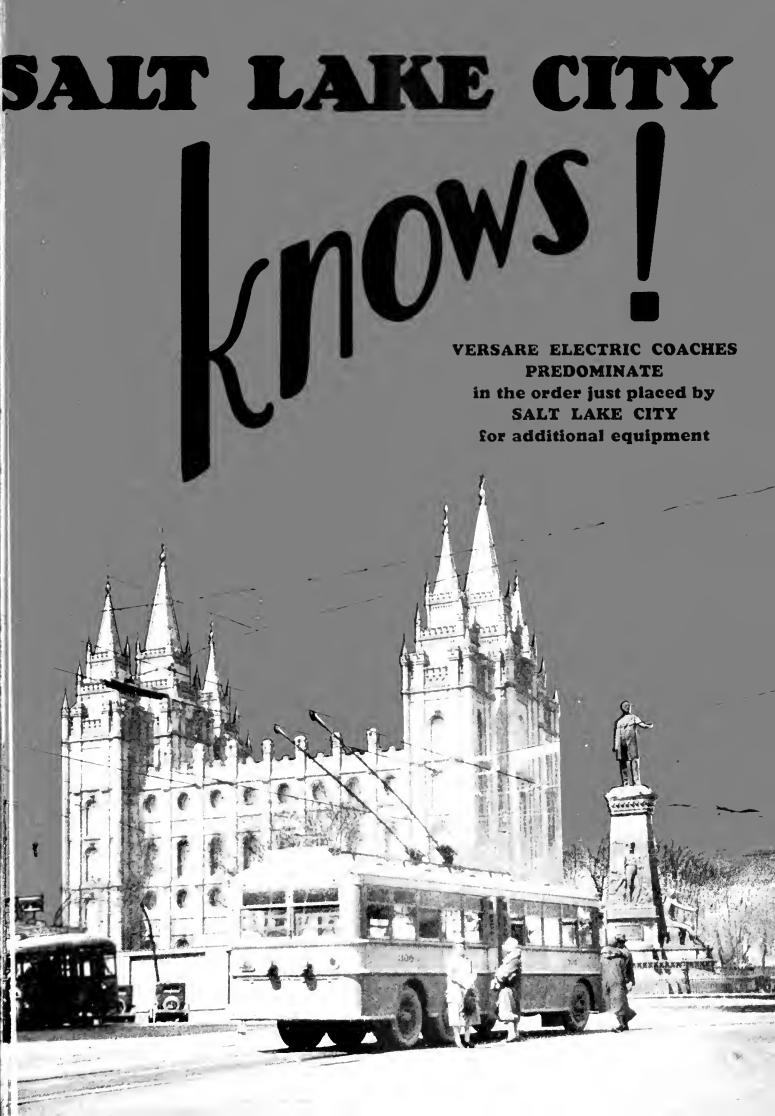
DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial Drying Ovens and Blow Pipe Systems.

MAHON

SPRAY BOOTHS & EXHAUST STACKS

DESIGNED FOR FIRE SAFETY



VERSARES ARE



-performance proves Versare superiority

VERSARE engineers no longer grope for facts. Versare purchasers are not asked to make their property a laboratory of experimentation.

The Versare Electric Coach ceased to be an experiment hundreds of thousands of miles ago.

Ask Salt Lake City—ask the Utah Light and Traction Company—they know!

Versare Electric Coaches in Salt Lake City have gone a total of over 250,000 miles, have carried more than 1,500,000 people in 9 months' time.

CHOSEN AGAIN

Here are the facts-

Weather conditions in Salt Lake City are <u>not</u> ideal. Winters are severe, snow storms frequent; summers are hot, with tourist traffic jamming the streets.

And Versare Electric Coaches showed an operating ratio of 62.9!

Compare that figure with your own.

We've got the facts,—and more than that—the experience. Our recommendations are authoritative and unbiased—for we make street cars, motor coaches, and electric coaches.

Let Versare performance speak for itself.



Complete details of construction of the new Versare Electric Coaches for Salt Lake City will be announced next month. These new coaches will embody several desirable changes—many improvements, which will be of interest to every Electric Railway Executive.

There is no longer any reason for experimentation, no longer any reason for large operating ratios. Versare recommendations are based on practice, not hopes, Versare Coaches are built to do a definite job, they have more than demonstrated their ability to create economy—to build business.

THE CINCINNATI CAR CORPORATION
Winton Place
Cincinnati, Ohio



BOOKS PADS STRIPS

NCREASED Revenue possibilities of tickets in books, pads and strips are:

- 1. Attractive price to the public, yet limited riding privileges;
- 2. Faster collection and less change making;
- 3. Guarantee a definite number of rides which the auto will not get;
- 4. Secure money in advance;
- 5. Spent more readily than money;
- 6. Salable advertising space on covers and backs

We recommend the 25/32 ticket size. It saves stock and 125 lbs. shipping weight per million, makes a small book that fits the pocket or handbag safely, does not fill up small fare boxes on long runs, and costs less per thousand in large lots.

Which style shall we send?

Write Nearest Office

Offices: Syracuse Baltimore Cincinnati

Cleveland

Factories: Philadelphia Los Angeles Boston

Pittsburgh Springfield, Mass.

New York Jacksonville

lobe TICKET COMPANY

> 112 North Twelfth Street PHILADELPHIA

In Wisconsin, too, their maintenance this improved

THE Northern States Power Company, operating throughout the western part of northern Wisconsin, has made extensive and profitable use of Carey Elastite System of Track Insulation.

The photographs show how this advanced system was used at Eau Claire, in the Badger State, in connection with a standard 85-pound A.S.C.E. T-Rail and a roadway of concrete...



Showing the application of Carey Elastite System of Track Insulation on the Northern States Power Company's lines through Eau Claire, Wisconsin.

they lowered cost by using traction development



The completed installation—Carey Elastite System of Track Insulation, used in connection with a standard 85-pound A.S.C.E.

T-Rail and a roadway of concrete.

Carey Elastite System of Track Insulation

is a resilient, durable, asphalt-and-fibre cushion. The asphalt has an extra-high melting point; yet, because it is blended according to a special Carey formula, it cannot become brittle even at sub-zero temperatures. It bonds firmly to the rail and to the pavement. It absorbs rail vibration and reduces excessive track noise. Invariably its use insures faster schedules, higher standards of service and lower maintenance cost.

If you are planning any development or track reconstruction work, it will be to your advantage to know Carey Elastite System of Track Insulation. Our representative will gladly call and supply you with the facts.



COMPANY, Lockland, CINCINNATI, OHIO



Small brushes are formed before the final furnace treatment



Presses for individual moulding of small brushes

SMALL brushes, such as those used on fractional horse-power motors and for automotive equipment, can be moulded to size direct from the powdered mix of carbon and pitch. Mechanical presses are used. Some of them operate much like the pill presses used by drug manufacturers.

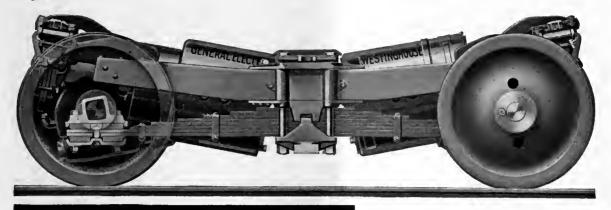
The small brushes moulded in this way are quite accurate in size and shape, requiring little subsequent work to make them accurate to dimensions.

As these brushes come from the presses, however, they do not have the required electrical and mechanical characteristics. A long baking process followed by many mechanical operations is still necessary.

Because National Carbon Brushes are made with such scrupulous exactness they make your electrical machines more efficient—more powerful—steadier to run. These brushes allow your machines to operate for years without attention. We take pride in the fact that leading manufacturers of small motors use National Pyramid Brushes as standard equipment.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown on request to any organization of engineers or students.





Ring up more fares, cut operating costs—with quieter, smoother performance, less weight, longer equipment life, lower maintenance costs; with Timken Worm Drive Trucks for electric railway cars

or ELECTRIC RAILWAY CARS

THE TIMKEN DETROIT AXLE COMPANY, DETROIT, MICHIGAN

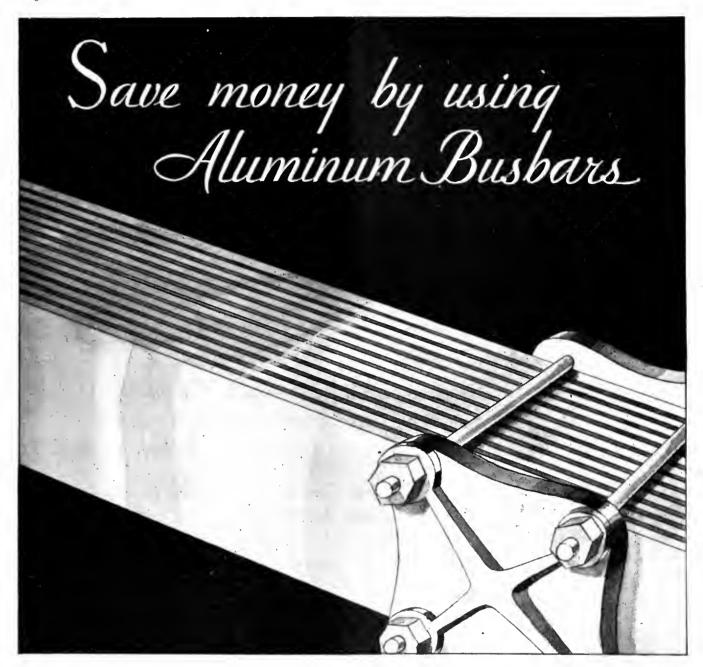


TULC

lubricants are specially compounded to meet street railway needs. The continuous use of TULC will give unexcelled lubricating results—produce longer life of bearings-show a saving in power consumption, etc.

Make a test of TULC

THE UNIVERSAL LUBRICATING COMPANY CLEVELAND, OHIO



DURING the year 1928 Aluminum Busbar was installed in the power plants of more than twenty entirely different characters of industry. In each instance a definite saving in the initial cost of installation was effected.

And in each instance Aluminum Busbar is rendering reliable, satisfactory service, day in and day out.

The booklet, "Aluminum Busbars," contains useful tables of weights, carrying capacities and physical properties, together with photographs of various installations. Please send for your copy.

ALUMINUM COMPANY OF AMERICA 2463 Oliver Bldg., Pittsburgh, Pa. Offices in 19 Principal American Cities





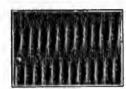


mileage

Free Rolling means Easy Riding



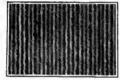
How FISK Motor Coach Balloons add to the safety and comfort of your passengers and increase your profits



Ordinary Cord

01010101010101010101

Cross-section of ordinary cord, showing how the cross-threads in the fabric cause an uneven deposit of rubber, and produce extra chafing and overheating whenever the carcass is flexed.



Fisk All-Cord

Cross-section of Fisk All-Cord, showing how the tough cords, free from cross-strings, are completely surrounded by live rubber. This revolutionary process prevents friction and overheating — explains Fisk's proved ability to deliver excess mileage.



All-Cord construction, perfected by Fisk, keeps Fisk Tires free from internal friction. This better process does away with cross-strings in the tire carcass—prevents unnecessary chafing and wear every time the tire flexes.

As a result, Fisk Tires roll easier than tires built the ordinary way. They yield without resistance to every road condition, giving maximum comfort and safety over any kind of going.

And because Fisk's All-Cord process prevents overheating, these sturdy tires deliver the kind of mileage that helps you pile up profits. If you want to carry the greatest number of passengers at the lowest cost per mile, equip your fleet with Fisk All-Cords.



Big sky scrapers grow on small sites

Great buildings rise on small parcels of land and yield big revenues . . . Likewise big returns on motor coach operation are often made as the result of a small investment . . . What follows is the story of what happened in a live city of 20-mile area.







a small experance a small experance a profitable

Erie, Pa. proved this with YELLOW COACHES

A clear case of where the tail wagged the dog.

Erie, Pa. possessed the usual type of street railway, typical of a city of 140,000 inhabitants.

Faced with the necessity of establishing additional lines demanded by the public, and desirous of keeping out competition, the Erie Coach Company was organized as a subsidiary to the railway, and four Z-29 passenger Yellow Coaches were placed in service over one route in December, 1925.

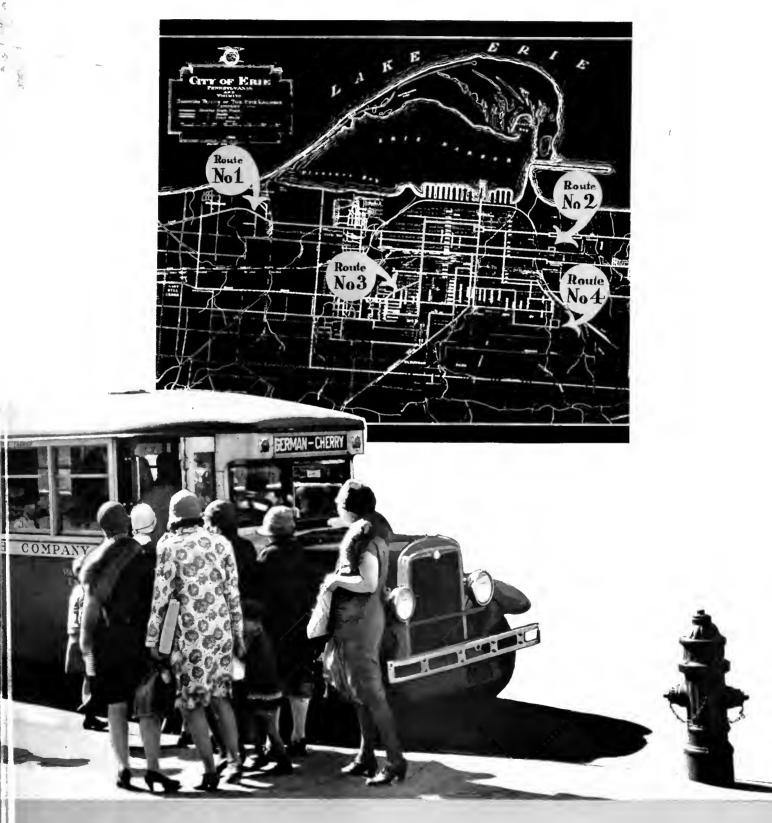
What was in reality an experiment and an effort to forestall competition grew rapidly into a profitable operation. More routes were selected for motor coach service and additional coaches added by a steady stream of re-orders as expansion of motor coach service was pushed rapidly to keep pace with the acceptance of the riding public toward this convenient form of transportation. It was not long before four new routes were established all served with Yellow Coaches—22 in all.

How quickly a small experiment turned into a worthwhile major operation may be seen from the record of successive orders.

- 4 Z-29 passenger coaches in June, 1925
- 2 X-21 passenger coaches in June, 1926
- 1 X-21 passenger coach in August, 1927
- 1 X-21 passenger coach in October, 1927
- 1 X-21 passenger coach in April, 1928
- 2 X-21 passenger coaches in May, 1928
- 4 X-21 passenger coaches in July, 1928
- 2 W-21 passenger coaches in November, 1928
- 2 W-21 passenger coaches in March, 1929
- 2 W-21 passenger coaches in April, 1929
- 1 W-21 passenger coach in June, 1929

Results, gauged by revenues, make the company feel that they can profitably continue to extend their motor coach operations—all of which are within the City of Erie.

nent can grow into najor operation....





Give the public what it wants and it will ride.

The fact that the people of Erie rode Yellow Coaches turned an experiment into rapidly-growing and profitable operation.

1,048,000 passengers were carried last year, with revenue dropping off but very little during the summer months. The Yellow Coach fleet piled up a total of 484,000 revenue miles at an operating cost that earned a satisfactory return on the investment involved.

Erie experimented. The public responded. Results exceeded expectations.

Erie is only one of a great many progressive electric railway companies that began

bus operation by first experimenting with Yellow Coaches in a small way on some unprofitable route or on some new route into previously unserved territory. The public responds. Revenue climbs. Results usually exceed expectations. Then follow in rapid succession more routes and more Yellow Coaches.

This explains why 80% of Yellow Coach sales are repeat sales. The successful experience, individually and collectively, of Yellow Coach operators naturally influences their choice of equipment. There is no other way of explaining the fact that "80% of Yellow Coach sales are repeat sales."

GENERAL MOTORS TRUCK COMPANY, PONTIAC, MICH.

Interurban Lines—

gain a new protection and service with National Fare Registers

The interurban operator today finds in National Fare Registers a new and better method of collecting fares, an assurance that all money collected is turned in and a decided operating economy. Interurban lines which have installed these machines have profited both from the protection and quick service which they provide and from the detailed information which is made available for the auditing department.



Typical expressions from users of National Fare Registers

We made a thorough investigation of up to date fare systems before adopting National Fare Registers. We are very well satisfied with the performance of the machines.

Cincinnati, Hamilton & Dayton Railway Co.

The records furnished by both the ticket office and car registers have materially aided our auditing department in checking fares and collections.

Chicago & Joliet Electric Ry. Co.

The same results which prompted these expressions of satisfaction are available to any interurban line. Our representative in your city will be glad to demonstrate the machine and to show in detail what it has accomplished for others and what it can do on your cars and in terminal stations.

THE NATIONAL FARE REGISTER

Product of The National Cash Register Company Dayton, Ohio



STEEL WHEELS

AMERICAN STEEL FOUNDRIES

MEW MORE

CHICAGO

BIBOL FR



Giving Impetus to Transportation

SPEEDY transportation is vital to present-day conditions. Car riders want it; car owners need it.

An important factor in the realization of this objective is the Safety Car Control Equipment. It brings economic advantages that warrant additional cars . . . assures the quickest possible brake action . . . provides maximum convenience and flexibility in controlling entrance and exit. . . . safeguards operation by interlocking power, brakes, and doors and by centralizing responsibility.

Safety Cars are giving a noteworthy impetus to transportation service on hundreds of traction properties.





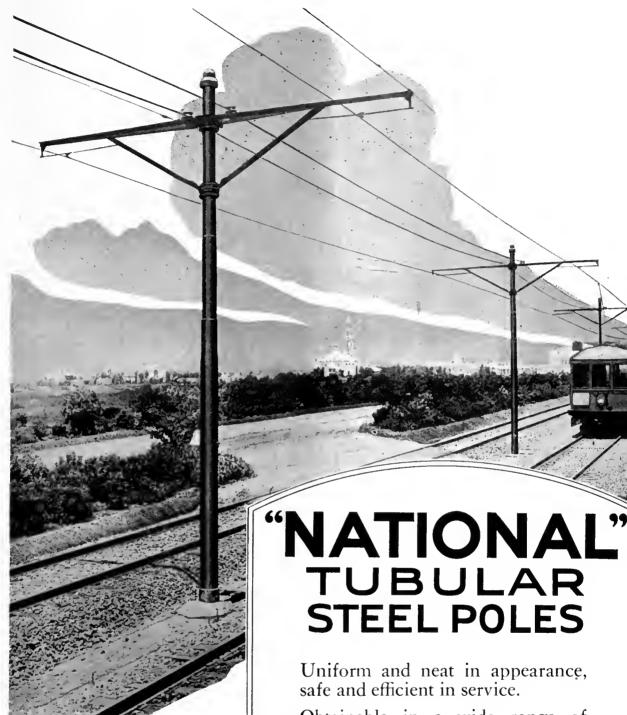


Subsidiary of United States Steel Corporation

208 S. La Salle Street, Chicago

30 Church Street, New York

Other Sales Offices: Boston Cleveland Worcester Philadelphia Pittsburgh Buffalo Detroit Cincinnati Baltimore
Wilkes-Barre St. Louis Kansas City Minneapolis-St. Paul Oklahoma City Birningham Atlanta Memphis Dallas Denver Salt Lake City
U. S. Steel Products Company: San Francisco, Los Angeles, Portland, Seattle Export Distributors: United States Steel Products Co., 30 Church St., New York



Obtainable in a wide range of dimensions.

Adaptable to various types of service, including electric railway; electric transmission; signal; telephone, telegraph and street lighting.

Our engineers will be glad to assist in selecting the right pole for any particular installation

NATIONAL TUBE COMPANY · Pittsburgh, Pa.

Subsidiary of United States Steel Corporation

NATIONAL

Ask for a Copy of Bulletin No. 14 — NATIONAL TUBULAR STEEL POLES



In today's heavy traffic—increased wheel mileage with lower maintenance cost, can be obtained in "Standard" wheels.

Durability, increased wearing qualities and safety are forged and rolled into "Standard" Wrought Steel Wheels.

STANDARD STEEL WORKS COMPANY

PHILADELPHIA, PA.

Products

Tires Billets
Wrought Steel Wheels
Steel and Malleable Castings
Steel Tired Wheels Forgings
Springs Axles Pins Rods



SALES OFFICES:

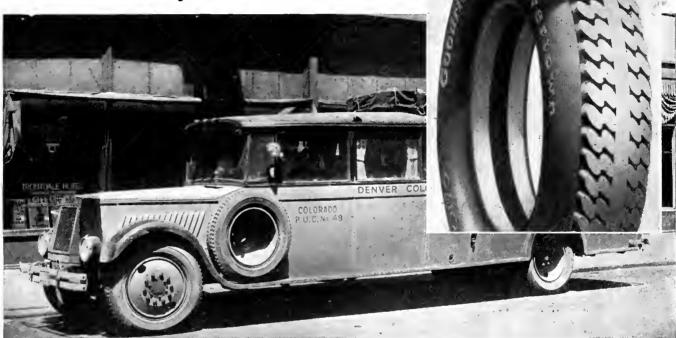
WORKS: BURNHAM, PA.

New York Chicago St. Louis
Richmond Portland
San Francisco

SPECIFY GOODRICH ON YOUR NEXT BUS

Goodrich heavy duty Silvertowns run over 1,000,000 miles on

D. & R. G. W. Railway Bus Lines



"For The Past Three Years We Have Used Goodrich Tires Exclusively," Says 1. B. James, President and General Manager of The Denver-Colorado Springs-Pueblo Motor Way, Inc.—One of Three D. & R. G. W. Ry, Bus Line Subsidiaries.

"ONE of the things that has especially appealed to our operation is the type of service that your Company has rendered, which has permitted us to keep our busses in uninterrupted service at all times," Mr. James writes.

"Some tires in operation at the present time are going strong at over 40,000 miles."

The twenty-eight busses operated by the three bus line subsidiaries of the D. & R. G. W. Ry. travel over one million miles annually on Goodrich Heavy Duty Silvertowns. Study the specifications below.

Seven Superior Specifications BUILT INTO EVERY HEAVY DUTY SILVERTOWN

- 1. Heavily insulated stretch-matched cords.
- 2. Additional adhesion—from greater insulation between outside plies.
- 3. Heavy twin beads for better rim seating.
- 4. Extra gum fillers between plies for longer tire life.
- 5. Heat-resisting, interlocking cord breakers.
- 6. Tread designed correctly for heavy duty service.
- 7. The whole tire toughened by the famous Goodrich "water cure."

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ontario.

Goodrich Silvertowns



The Texas Company announces

With the acquisition of the Penniman patent rights and in combination with other rights, The Texas Company is in a position to offer to the Electric Railways of the country a new power-saving principle of lubrication.

Speaking conservatively, a 20 per cent saving in power is assured -33 per cent has been attained.

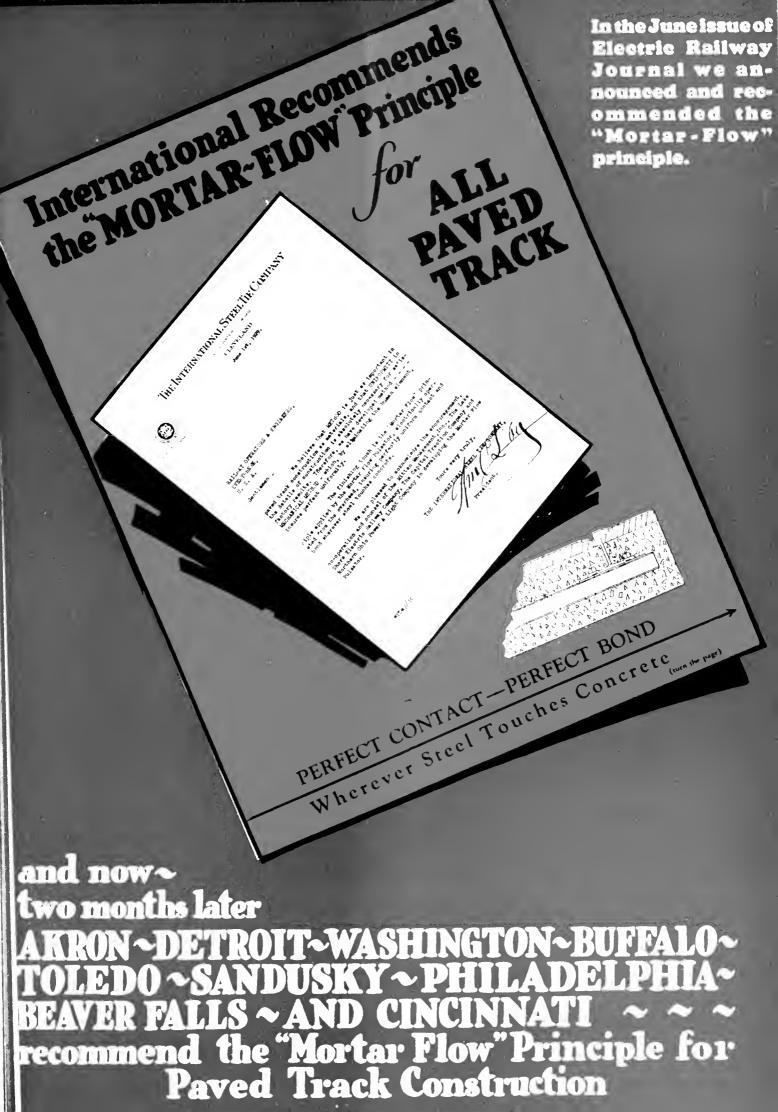
Executives of Electric Railways are invited to correspond with us to secure complete data.

THE TEXAS COMPANY

Lubricating Division

Dept. L, 17 BATTERY PLACE, NEW YORK CITY

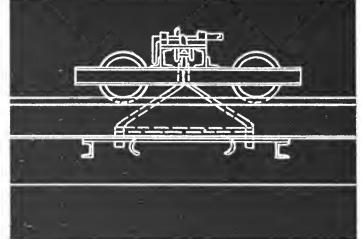
NOTE—these savings do not require any radical change in present methods



PERFECT CONTACT~PERFECT



UNIFORMITY STARTS

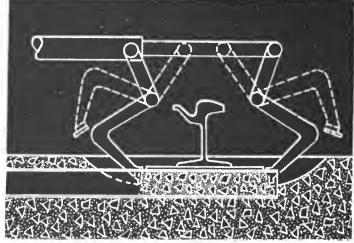


AT ASSEMBLY

TO INSURE uniform track, all parts must be uniform and assembly must go smoothly. Steel twin ties are uniform. The D.S.R. Track Layer lifts steel twin ties to the rail base, requiring only one man. Assembly goes on smoothly, easily. Uniform results demand uniform methods.

UNIFORM CLIP FIT AND GAUGE

TAMPING MUST BE POSITIVE

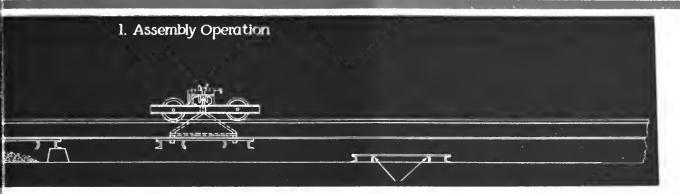


UNIFORM COMPRESSION TAMPING

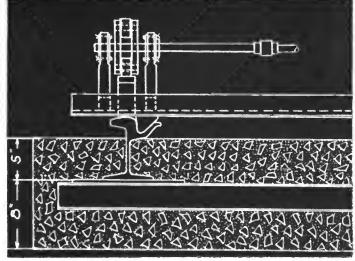
THE compression tamper exerts a uniform pressure on the concrete all-the-way-along. The tie base is assured 100% contact with the concrete. The compression tamper takes the place of many men with hand tools, speeds up the work; the compression tamper is vital where uniform results are to be obtained.

STEEL TWIN

BOND ~ UNIFORM TRACK



MINUTE VOIDS MUST BE REMOVED



UNIFORM BOND STEEL TO CONCRETE

TAMPING alone will not eliminate all voids. In Steel Twin Tie Track construction the finishing operation employs the "mortar-flow" principle. The "mortar-flow" pulsator delivers mechanically 4800 impulses per minute to the track. This causes a mortar flow which unites steel of rail and tie, and the concrete, in perfect bond — assuring absolute uniformity of track structure, and perfect contact of all elements.

UNIFORM RESULTS DEMAND UNIFORM METHODS

ASK Washington—ask Detroit—ask Philadelphia—ask any of the cities listed on the first page of this insert—they've used the complete International method of huilding paved track. They're enthusiastic about it—they've found out that uniform results can only follow uniformity in all construction operations—and that uniform results mean track that lasts longer—wears evenly—is easier to build. The "mortar-flow" principle is, we believe, the only way to be assured of "every-foot-just-like-every-other-foot" track.

And that kind of track is what all the shouting is about—that kind of track is what we've all been trying to build ever since the first rotted wood tie was pulled out from under the main line of the horse-car express.

Steel Twin Ties—mechanical track assembly—compression tamping—complete contact and bond—that's the formula for twenty-year track.

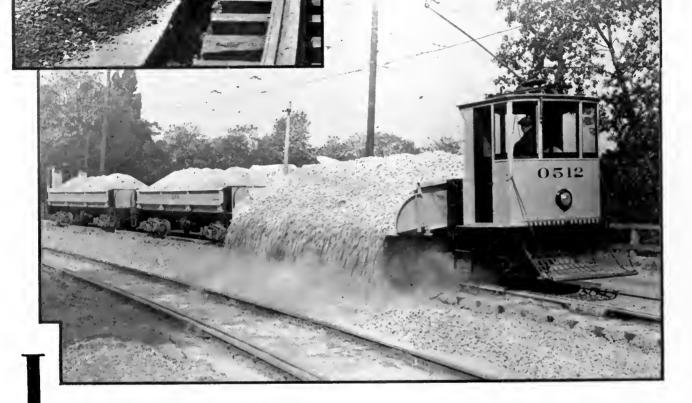
Write for delivered prices on Twin Ties, and the detailed progressive operation drawing.

THE INTERNATIONAL STEEL TIE CO., CLEVELAND, OHIO

TIE TRACK

YOU NEED~~

Modern Equipment To Meet Modern Methods



keeping with the trend toward modern mass methods in track construction, materials must be brought to the job promptly and handled with dispatch.

Differential Dump Cars, Differential Truck Bodies with the 3-Way Dump—right, left or rear—Differential Electric Locomotive Cranes and Clark Concrete Breakers enable you to keep pace with the speed and uniformity of modern track laying methods.

As evidence of this fact, ask any of the 67 representative electric railways who use and endorse Differential equipment.

We'll be glad to lay facts and figures before you. Write.



Differential Electric Locomotive Crane Car for Electric Railway Service

THE DIFFERENTIAL STEEL CAR COMPANY

FINDLAY, OHIO, U.S.A.



Wrap the coils with No. 28 Micanite Paper. It's positive protection against heat and vibration. The paper may dry and deteriorate—as paper and cloth will with time—but the mica remains unaffected and securely held in place by the specially prepared binder. Tests prove conclusively that coils wrapped with this Micanite Paper have 10 times the life of coils wrapped with treated cloth.

This Micanite Paper is the product of years of development. Both sides of a strong condenser paper are uniformly coated with a special shellac binder. A layer of mica is bonded to only one side of this coated paper, so that, when coils are wrapped the shellac on the reverse side binds on the mica. A solid enduring coil is formed from which all air pockets are eliminated.

Manufacturers of electrical machines are invited to investigate this coil insulation. No. 28 Micanite Paper is made in rolls or sheets. Let us send you a sample for test.

MICA INSULATOR CO.

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Works: Schenectady, N. Y. and London, England

Cleveland
Pittsburgh
Cincinnati
Seattle
Toronto

San Francisco Los Angeles Birmingham Montreal



55 INSULATOR W

REG. U.S. PAT. OFF,

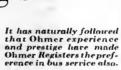


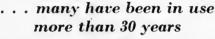
LONG MANUFACTURING CO. DETROIT MICHIGAN

LONG PRODUCTS-AUTOMOTIVE CLUTCHES AND RADIATORS



all interurban lines use OHMER Registers







ON THE PACIFIC COAST FOR EXAMPLE...

THE Key System Transit Co., Oakland, California, is now using 215 Ohmer Registers. The original contract, made in 1904, was recently again renewed. When the new contract expires, this company will have used Ohmer Registers for 31 consecutive years.

The Pacific Electric Railway Co., Los Angeles, is now using 1,000 Ohmer Registers. Including the term of the contract which was renewed recently, this company will have used Ohmer Registers continuously for 28 years.

The Southern Pacific Co., San Francisco, has 200 Ohmer Registers in use. The latest contract renewal will give it 24 years of continuous Ohmer Service.

And so the list goes on.

OhmerRegisters clearly indicate and untamperably record each fare in its proper classification at the time it is paid. That is why 90% of all electric interurban lines use Ohmer Registers. They have found that these registers speed up eollections, stop losses, reduce overhead and increase profits.

And Ohmer has kept pace with transportation developments. The Ohmer ticket-printing registèrs likewise are preferred equipment for motor coach service . . . ideally adapted to the peculiar requirements of bus transportation.

Write today for full information about Ohmer moncy-saving, profit-building registers.

Here are a few of the many OHMER installations in electric railway cars and motor coaches

installations in electric railway cars and motor coaches

Aurora, Elgin and Fox River Electric Company, Aurora, Hilinols.
Trenton, New Jersey.
Chicago and Joliet Electric Railway Company, Joliet, Hilinols.
Chicago, South Bend and Northern Indiana Railway Company, South Bend, Indiana.
Coast Cities Railway Company, Asbury Park, New Jersey.
Interurban Transportation Company, Alexander, Louisiana.
Lake Superior District Power Company, Hexander, Louisiana.
Lake Superior District Power Company, However, Louisiana.
Monongabela Transportation Company, However, Louisiana.
Monongabela Transport Company, Morgantown, West Virginia.
Monongabela Transport Company, Fairmont, West Virginia.
North Branch Bus Company, Bloomsburg, Pennsylvania.
Penn Bus Lines,
Bridgeville, Peonsylvania.
Rocklord Public Service Company,
Rocklord, Illinois.
Tri-State Transit Company,
Huntington, West Virginia.
Automotive Transportation Company,
Providence, Rhode Island.
Hamburg Railway Company,
Buffaio, New York.
Atlantic City, New Jersey.
Hudsnn Transportation Company,
Colen Fails, New York.
Motor Coach Company,
Long Beach, California.
Tennessee Transportation Company,
Nashville, Tennessee.
Bohi Brothers, Inc.,
Albany, New York Olion and Company,
Subsidiary of the Great Northern Railroad)
Lumber Railroad)
Lumber Railroad)
Lumber Railroad)
Lumber Railroad)
Yadkin Coach Company,
Buston, Massachusetts,
(Subsidiary of the Great Northern Railroad)
New England Transportation Company,
Buston, Massachusetts,
(Subsidiary of the Great Northern Railroad)
Northland Transportation Company,
Buston, Massachusetts,
(Subsidiary of the Great Northern Railroad)
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New England Transportation Company,
Buston, Massachusetts,
(Subsidiary of the Great Northern Railroad)
Onthers of the Yadkin Railway Company)
Southwestern Transportation Company,
Little Rock, Arkansas,
(Sub

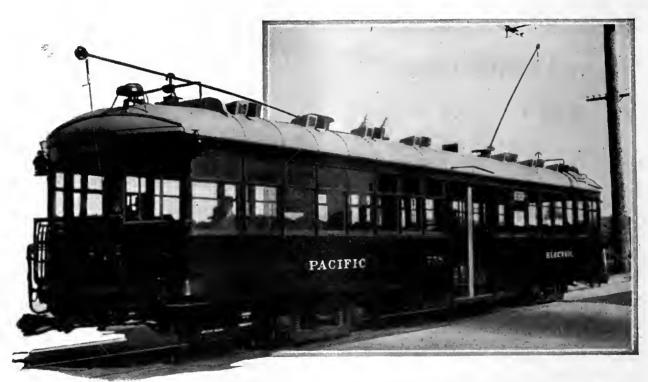
FARE REGISTER COMPANY

DAYTON, OHIO

The HYATTWAY to Hollywood

BY adopting Hyattized journal boxes on 10 cars, Pacific Electric is the latest street railway to furnish superlative passenger comfort ... and the latest to insure permanent power and maintenance-saving operation.

Hyatts banish friction and transmit power, effortlessly, without waste. Revolving with the wheels in true rolling motion they permit smoother starts, faster get-away, and maintain higher speeds without hot-box annoyances.



One of 10 Hyott equipped cars recently put into operation by Pacific Electric on its Hollywood line and other suburban routes.

FINAL TIES

Accompanying this marked improvement in performance there is also a noticeable reduction in maintenance. Sturdy Hyatt bearings rarely show wear and seldom require attention beyond infrequent lubrications.

Hyatt journal boxes keep cars where they belong ... on the lines, promoting passenger good will, ringing up profits which are not offset by inefficient bearings.

These advantages are so essential to safeguard equipment investments, Railways are fast becoming Hyattways...for the Hyattway is the saving way.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland

STEEL SERVICE

INLIMITED manufacturing facilities, from the mining of the ore until the finished product is ready for shipment, enable us to promptly and efficiently supply your steel requirements. When immediate delivery is desired, our six conveniently located warehouses render admirable service. Of special interest to the electric railway industry are the products listed below. Descriptive literature may be obtained on request

STANDARD STRUCTURAL SHAPES
CARNEGIE BEAM SECTIONS
BAR MILL PRODUCTS
STEEL CROSS TIES
WHEELS—AXLES
RAIL JOINTS
TEE RAILS



CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation

CARNEGIE BUILDING ∞ PITTSBURGH, PA.

21





Seven Steps

Sech a stage
in the journey
that Leads to
miliage

Multiplied Mileage



In the rolling operation seven rolls operate simultaneously on the rim and web of the wheel blank. The structure of the rim is refined, more mileage assured.

.... The course of Gary Wrought Steel Wheels from wheel block to shipping dock is a straight one toward multiplied mileage. Modern shop facilities, up-to-the-minute equipment, spacious buildings and painstaking inspection all contribute to high wheel mileage. Every wheel that leaves the warehouse helps to maintain and add to the reputation that Gary Wheels enjoy. Our wheel engineers are at your command.

Illinois Steel Company

Subsidiary United States Steel Corporation

General Officen: 200 South LaSalle Street .. Chirago



In the machining operation scientifically designed equipment machines the tread and flange, faces and rough bores the hub. and gives the wheel a workmanlike finish throughout.

Rigid schedules, greater speed, frequent starting and stopping—all spell the need for durable and dependable wheels in electric ratiway operation. In Gary Wheels steel-making knowledge is combined with wheelmaking experience to assure long and trouble-free wheel Service.



The coning press forms the web of the wheel to the proper curva-ture or "cone." This is the last of the "hot" operations.



Here a ten-thousand-ton hydraulic press transforms a wheel block into a wheel blank. The hub is formed; the flange and rim par-tially formed.



After the wheel blank has been placed in centering die, a cylindrical block is removed from center of hub by the punching die.

WROUGHT



In the Final Inspection men trained by experience examine every wheel thoroughly, in order that only perfect wheels may leave the plant.



WHEELS







Spray guns of various types and sizes.

Pressure feed paint tanks and containers.

Spray booths, exhaust fans, and approved lighting fixtures.

Air compressing equipment.

Air transformers and accessories.

Air and fluid bose and connections.

Complete outfits from the smallest band-operated units to the largest industrial installations.

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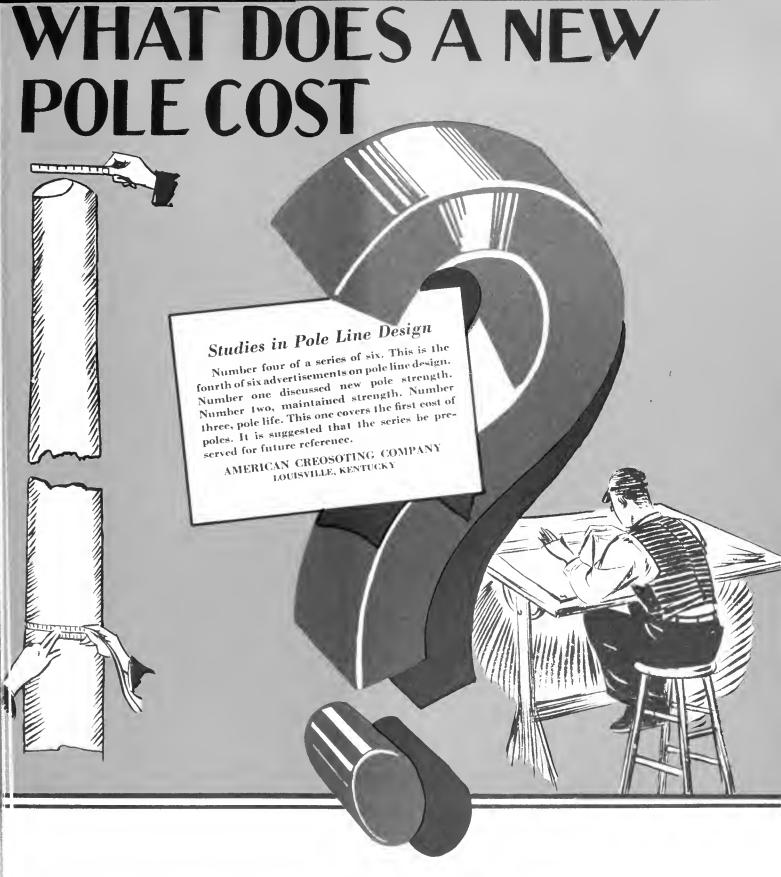
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Why Specify an 8-inch Top When Economical Design Calls for a 28-inch Circumference at the Ground Line?

Are Low Priced Poles Economical?

While low first cost is not the sole criterion of economy in pole line construction, it is much sought after. The economy of a pole cannot he determined by a price quotation. The pole line designer knows that the delivered cost of the poles is only a small part of the total line cost. A low unit price on poles may mean a higher line cost because more poles are required. Conversely, the most expensive pole may make possible a design which will be the most economical in total cost.

How Pole Characteristics Affect Line Costs

The investment in a pole line includes in addition to the poles the cost of labor for setting, the conductor, cross arms and fittings, labor to install pole fittings and to string conductor, supervision and overhead. Of these items, only the conductor, supervision and overhead are unaffected by changing the poles. The strength of the pole affects the span and therefore the number of poles needed. The cost of setting, the cost of cross arms and fittings and labor for installing is, of course, directly proportional to the number of poles. The cost of stringing conductor is also affected somewhat by the span.

Pole length, span, allowable conductor sag, and minimum clearance above the ground are all inter-related

factors that must also be studied to get the most economical solution for any particular line.

How to Determine the Most Economical Pole

The careful designer selects the most economical type of pole by process of "trial and error". The entire line cost is calculated with a number of pole types and sizes to see which gives a combination of costs with the lowest total. As pointed out in the first "study" the ground line circumference of a pole can be derived from the assumed loading and the known ultimate fibre stress of the wood. By adding the cost of a pole of that size to the other items of cost in the line the total is found, which is set down for comparison with totals similarly calculated for other types of pole.

Practical Considerations Limit Theoretical Design

Such comparative cost estimates generally indicate that the longer the span the lower the total cost. But this theory cannot be followed far without striking a number of practical difficulties. First, the strength of conductors limits the span. Then the sag in long spans may require poles too long for commercial standards and prohibitively expensive. Appearance is a factor that must also be dealt with since economy at the expense of public good will is too costly.

Howto SaveWithout Sacrificing Pole Strength

Even after the correct ground line circumference has been calculated for a pole that will give the most economical line within the limitations imposed by local conditions, there still remains the problem of so specifying the pole as to insure the calculated strength without unnecessarily increasing the cost of production.

Many of the old methods of specifying were satisfactory in the days of plentiful pole supply and consequent low cost. The wide range of sizes possible under such methods was also justified to a large extent by the fact that deterioration was rapid, and over-size in a pole provided an additional factor of safety. But with pole costs on the present level, the more accurate specification of sizes made possible by pole types which maintain initial strength over long periods becomes of vital importance.

Since wood poles are a product of Nature, there is no way to prevent a wide variation in the taper. If pole size is specified by the top dimension, this results in a wide range of size at the ground line. But the ground line is the critical section in which strength must be judged. It is logical, therefore, to specify pole size by circumference at the ground line, with a secondary requirement covering top dimension to insure a degree of strength at that point in keeping with the load to be carried by the pole. The accompanying table shows minimum dimensions for standard Amcreco Creosoted Southern Yellow Pine Poles.

TABLE OF POLE DIMENSIONS

	Distance of Ground Line From Butt (Feet)	. SIZE CLASSIFICATION BY MINIMUM CIRCUMFERENCE—INCHES													
Length of Pole (Feel)		CLASS AAA		CLASS AA		CLASS A		CLASS B		CLASS C		CLASS D		CLASS E	
		Төр	6 feet From Bull	Тор	6 feet From Butt	Тор	6 feet From Butt	Тор	6 feet From Bull	Тор	6 feet From Butt	Тор	6 feet From Butt		6 feet From Butt
16	4											16	201/2	15	181/2
18	4									17	231/2	16	211/2	15	1916
20	4					20	28	181/2	261/2	17	241/2	16	22 1/2	t5	201/2
22	41/2					20	29	181/2	27	17	251/2	16	23 1/2	15	211/2
25	5	23	331/2	211/2	31	20	30	181/2	28	17	261/2	16	241/2	15	221/2
30	51/2	23	35	211/2	331/2	20	32	1832	30	17	28	16	261/2	15	241/2
35	6	23	37	211/2	35	20	331/2	181/2	32	17	30	16	28	15	261/2
40	6	23	381/2	211/2	37	20	35	181/2	331/2	17	32	16	30	15	28
45	61/2	241/2	40	23	381/2	211/2	37	20	35	181/2	3314	17	32		
50	7	241/2	411/2	23	40	211/2	381/2	20	37	181/2	35	17	331/2		
55	736	241/2	43	23	4136	211/2	40	20	381/2	181/2	37				
60	8	241/2	45	23	43	211/2	411/2	20	40	181/2	3814				
65	81/2	241/2	461/2	23	45	211/2	43	20	411/2						
70	9	241/2	48	23	461/2	2t1/2	45	20	43						
75	91/2	241/2	491/2	23	48	211/2	461/2	20	45						
80	10	241/2	51	23	491/2	211/2	48								
85	101/2	241/2	521/2	23	51	211/2	491/2								
90	11	241/2	54	23	521/2	211/2	51								

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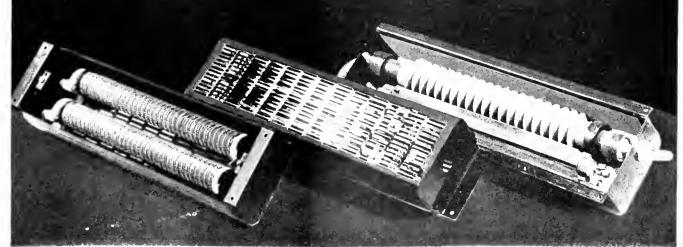
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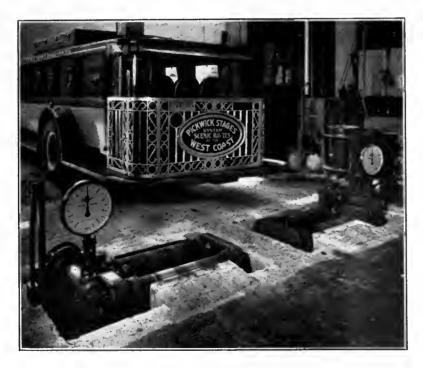
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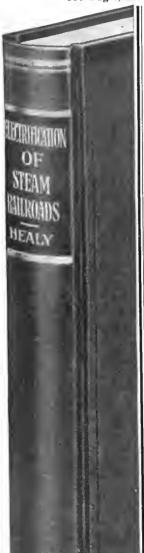
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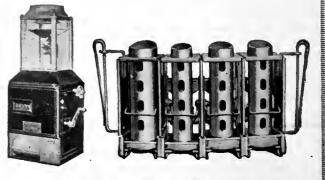
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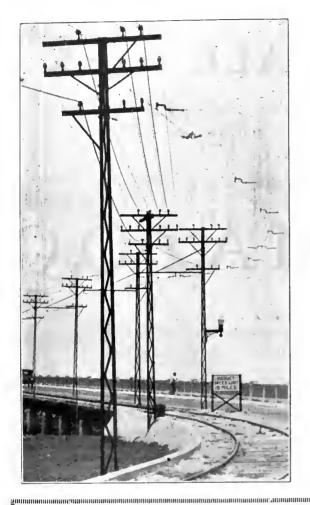
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ELECTRIC RAILWAY JOURNAL



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STREET railway man, 31, qualified by 14 years' experience in the operation and maintenance of cars and buses, at present superity neighbors, and buses, would like to connect with a progressive property where varied experience would be an advantage. PW-184. Electric Railway Journal, Tenth Ave. at 36th Street, New York.

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Bids: August 20.

Steel Passenger Cars, Etc.

New York, N. Y.

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Seaied bids or proposais, for furnishing and delivering three hundred (300) STEEL PASSENGER CARS, together with five (5) extra motor trucks and five (5) extra trailer trucks for the Independent System of City Subways in the Borough of Manhattan, City of New York, will be received by the Board of Transportation, acting for and on behalf of The City of New York, at the office of said Board at No. 49 Lafayette Street, Borough of Manhattan, New York City, until the 20th day of August, 1929. ct eleven-thirty (11:30) o'clock a.m., at which time and place or at a later date to be fixed by said Board, the proposals will be publicly opened and read. A description of the work and other requirements, provisions, details and specifications are given in the Information for Contractors and in the Form of Contract, Specifications, Contract Drawings, Bond and Contractor's Proposal, which are to be deemed a part of this Invitation and copies of which may be inspected and purchased at said office of the Board.

The receipt of bids will be subjected to the requirements specified in said Information for Contractors.

New York, July 2, 1929.

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By JOHN H. DELANEY, Chairman.

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RW-185, Electric Railway Journal Tenth Ave. at 36th St., New York City

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Think "SEARCHLIGHT" First!

G-2

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August, 1929 Electric Railway Journal

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Specialists in Railway Properties.

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a two-year-old Plane

YET IT BROKE A WORLD'S ENDURANCE RECORD

(Following material quoted and reproduced from New York World of May 27, 1929)

Plane Aloft 7 Days, 4 Hrs., 32 Minutes. Ends Record Flight

FORT WORTH, Tex., May 26—After setting a new world record of 172 hours, 32 minutes and 1 second for sustained flight, the monoplane Fort Worth glided safely down to earth here at 4:05 o'clock this afternoon (6:05 P.M., New York time).

The motor of their plane, a Wright Whirlwind, which had carried the rebuilt machine through more than 500 hours of flying before the endurance flight was started, was still in excellent condition.

FORT WORTH, Tex., May 26—The world at large appears to be amazed at

our little flying feat accomplished in a two-year-old plane, powered with a second-hand motor, but our principal astonishment is that we were forced to come down after only 172 hours and 32 minutes in the air.

Although we are back on earth after spending more than a week in the cramped environs of our rebuilt Ryan as it slowly but surely flew past every world's record for endurance flying, we have not been completely isolated.

i. . If flyers ever were blessed with a perfectly performing ship and a motor that stood every test put to it we are those two pilots. The Ryan

brougham in which we made the trip has been in use two years and has carried thousands of passengers for commercial hops. The Wright Whirlwind notor in the Fort Worth was second-hand when placed in this ship less than two years ago. It has gone more than 50.000 miles without a forced landing.

bettered every world's record for endurance flying. We are proud of its performance and of our part in setting up a record which, we hope, will aid in promoting public confidence in air travel and the safety and durability of sirplanes.

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SECOND-HAND

has an important part in all present-day industrial activity. When cost or delivery, or both, are urgent factors, don't let old prejudices prevent your giving it the consideration it deserves. Many dealers in second-hand equipment sell with guarantees that fully protect buyers. Some completely rebuild all equipment offered and their stocks include many types of the most modern items available.

If a used plane with a second-hand motor can help two aviators break an endurance record why not investigate what second-hand equipment can do for you in solving equipment problems within your budget limitations.

We Have Available:

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GE 80	WH 56			
GE 87	WH 101			
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GE 264				

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CP-27

CP-28

CONTROLLERS:

K-6

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Including other motors, trucks, compressors, controllers, fareboxes, and parts too numerous to mention here.

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Write or Wire Your Inquiries and Offerings.

Cars—Birney Buses, Locomotives, Substation and Snow Fighting Equipment.

They had FAITH in used equipment—

and used equipment brought them through!

READ the flight endurance record advertisement on the opposite page.

To some aviators an attempt to establish the world's record for sustained flight in a two-year-old plane with a second-hand motor, would appear a foolhardy venture. But not to Messrs. Robbins and Kelly! They had FAITH in used equipment and used equipment brought them through!

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Brilliant indications with a reserve lamp for each indication display.

RED—Stop. YELLOW—Proceed prepared to stop at next signal. GREEN—Proceed.

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Put your problem up to us.

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We Also Manufacture

Turn-right Signals, Automatic Block Signals for Single and Double Track, Stub End Signals, Annunciator Signals, Headway Recorders.

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Puts an end to the theft, of lamps

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Price per 100

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On your cars—in your shops—wherever you have an investment in lamps—LAMPLOK pays its way. For LAMPLOK prevents any except the man with the special extracting tool from tampering with your lamps. YOU DON'T BREAK THE BULBS TO REMOVE BURNED OUT LAMPS.

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33-passenger Palace Highway Pullman combining increased seating capacity with increased luxury of appointment.

Extra wide interior, added seat comfort, full head room in aisle. Luggage inside, out of the weather.



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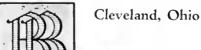
ADD to the 33 stationary seats, 8 auxiliary seats (everyone a comfortable one). A total of 41 in this popular type bus.

This additional capacity has been found by experience to be highly profitable on intercity and inter-state routes. Paralleling the increased seating capacity has come increased luxury of appointment. Typical of this is the exhaust fan completely renewing the air every four minutes... greater comfort.

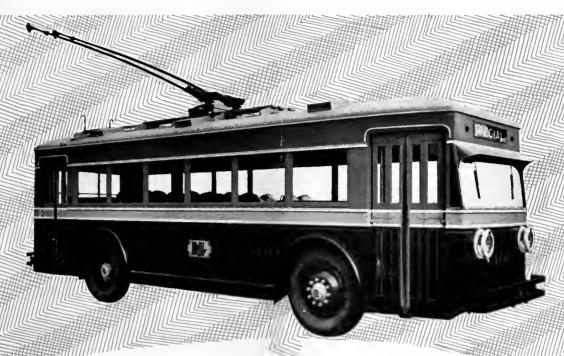
And increased passenger comfort means increased passenger revenue.

THE BENDER BODY CO.

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Outstanding Features of the New Brill Electric Coach

Brill MASTER UNIT design—exceptionally light weight, 14,500 lbs.—flexibility in traffic—circulating passenger load -automatic foot control-rear axle drive through noiseless reduction gears-high rate of acceleration-smooth and positive stops through four-wheel internal expanding air brakes—cam and lever type steering mechanism designed expressly for balloon tires—two 35 H.P. high-speed motors —seats 30 passengers.

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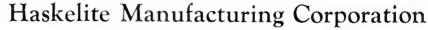
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Three Canadian railways specify HASKELITE

MORE evidence of the preference shown by street car manufacturers and operators for strong, light weight HASKELITE panels is found in the specifications for cars recently ordered by three Canadian properties. HASKELITE was specified for the headlining of 7 cars purchased for the Regina Municipal Railway. The Saskatoon Municipal Railway specified HASKELITE for roof material and interior trim as well as for headlinings in a 5-car order. And the Quebec Railway, Light & Power Company specified 3-16 in. HASKELITE for the headlinings of 15 new cars.

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ELECTRIC RAILWAY JOURNAL

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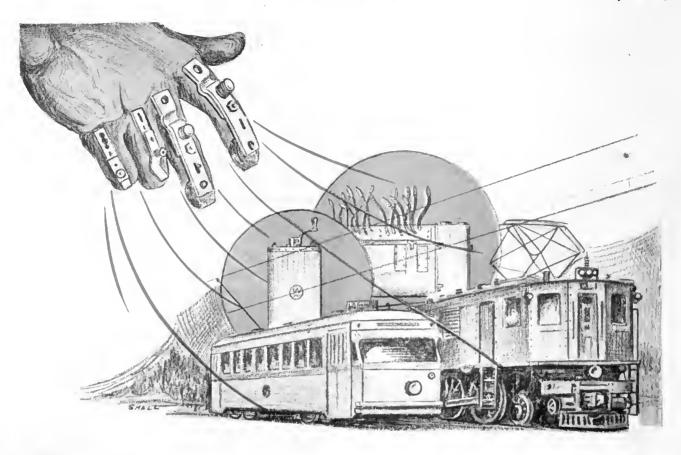
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COMPENSATING fingers are self-aligning. Regardless of the contour of the controller drum surface, Westinghouse compensating fingers automatically adjust themselves to the position of maximum contact.

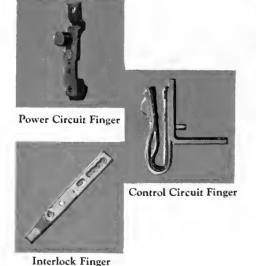
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Electric Railway Journal

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Pages 819-874

Louis F. Stoll Publishing Director

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This Varnish Keeps Your Motors in Service

Westinghouse Insulating Materials

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VARNISH that more than protects the surface; that has the vitality to resist constant strain and vibration; that may be depended upon to keep your railway motors out of the repair shop—that's Westinghouse No. 335 Varnish

This varnish prolongs the life of the motors, covering the windings and cores with a glossy, protective film—hard, but elastic, tough as rhinoceros hide, highly resistant to vibration, excessive moisture and heat.

Safeguard your motors with this insulating varnish of proved accomplishments.

Using Westinghouse Insulating Materials is like owning a million-dollar laboratory.



WESTINGHOUSE ELECTRIC & MFG. COMPANY EAST PITTSBURGH PENNSYLVANIA

SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES OF THE UNITED STATES



Westinghouse

axle pin.

Westinghouse-Nuttall harp with non-turning washers phosphor-branze shunt springs, and hardened

CUT CURRENT COLLECTION COSTS

OW-COST car operation necessarily requires trouble-free, maintenance-saving current collecting equipment. That's why so many electric railway companies are using Westinghouse Nuttall trolley bases, poles, harps and wheels.

In the light-weight US-20-A trolley base, Timken bearings, hardened wearing parts, twice-a-year lubrication, simplicity and accessibility safeguard long life and cost-saving service.

Poles of either butt-welded or genuine seamless tubing combine maximum strength with light-weight. Their tapered form gives ample resiliency and permits great deflection without permanent "set". They render long services under the severest condition.

Malleable iron harps for all standard wheels have the strength necessary to endure the buffeting that results when wheels leave the wire, yet they are light enough to preserve positive base spring action. The design and construction of all parts insure high conductivity.

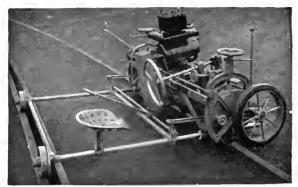
The trolley wheel is subject to worse abuse than any other part of the current collecting equipment, yet to be most economical, it must be light weight, run quietly and smoothly, give long wear, have high conductivity and cause no undue wear on the trolley wire. These requirements are met by Union Standard and Ideal wheels.

WESTINGHOUSE ELECTRIC & MFG. COMPANY NUTTALL WORKS PITTSBURGH, PENNSYLVANIA SALES OFFICES AND SERVICE SHOPS IN ALL PRINCIPAL CITIES CANADIAN AGENTS: LYMAN TUBE & SUPPLY COMPANY









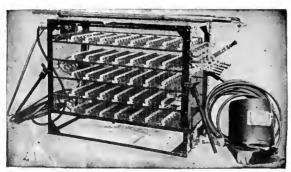
Improved Atias Rail Grinder



Eureka Radial Rail Grinder



Imperial Track Grinder



Ajax Electric Arc Welder

None but the brave deserve the fare

Courage to do what must be done to win and hold public approval—without it streetrailway rides can't be sold in sufficient volume to pay.

Costs money? Not much is needed to do the first thing first—provide good track.

Here is equipment that requires no great investment yet does so much.

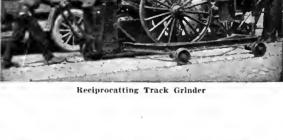
Railway Track-work Co.

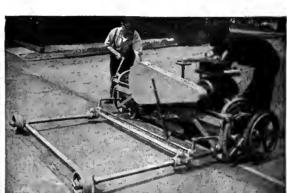
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Vulean Rail Grinder



Midget Rail Grinder

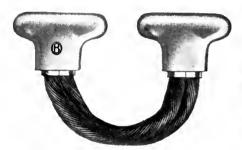


RTW Curve Oiler

A Few O-B Rail Bonds



O·B Titon Rail Bond, for head-of-the-rail installation by the copper alloy metallicarc process. Refer to page 667, O·B Catalog No. 20.



O-B Type AW-8 Rail Bond, for head-ofthe-rail application by the steel metallicarc process. Refer to page 666, O-B Catalog No. 20.



O-B Type ST-2 Rail Bond for head-of-therail application by the gas-weld process. Refer to page 51, Supplement No. 2 to O-B Catalog No. 20.



O-B Type AW-12 Rail Bond for base-ofthe-rail application by the copper alloy metallic-arc process. Refer to page 670, O-B Catalog No. 20.





"You Bet I'll Buy Them From O-B"

"WHEN your job is to keep the track circuit one hundred percent efficient, it's mighty necessary to know that the rail bond is going to do its part of the job—and that is just what we have found out about O-B rail bonds. When we put on an O-B bond it stays put and we don't have to worry about resistance or fractured welds."

All over the country you'll find that the men who have to "keep the wheels turning" are choosing O-B rail bonds—and saving themselves trouble by doing so.

They have found that the service life of an O-B rail bond is longer; that it goes on to the rail easier, and is mighty hard to get off. Consequently, breakage of the strand is the most probable point of failure—and O-B, by careful and proper design, reduces such breakage to an almost unbelievably low percentage. This design also insures low track resistance for the whole life of the bond.

Truly, there is a great difference in rail bonds. The man who knows has found a safe and sure way of buying bond satisfaction. He merely orders rail bonds from O-B.

Ohio Brass Company, Mansfield, Ohio Canadian Ohio Brass Co., Limited Niagara Falls, Canada



WHY PAY TRIBUTE?

EVERY steel wheel that demands re-turning exacts a tribute from maintenance funds that you can ill afford.

Many roads have revolted from this tyranny and

Many roads have revolted from this tyranny and by the use of Davis "One-Wear" Steel Wheels have escaped the penalty.

For Davis Steel Wheels are made from a special heat-treated composition that develops the precise characteristics necessary to a "One-Wear" Wheel.

A wheel tread demands a high resistance to wear without brittleness, the plate requires fatigue resistance while the hub should be ductile and tough.

These widely varying characteristics can only be developed by heat-treatment of a special composition wheel metal.

Such heat-treatment makes every part of a Davis "One-Wear" Steel Wheel ideally suited to the work it has to do.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS



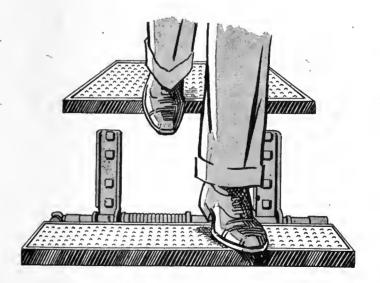


59th Street

Takes to

Treadle-ization

Three months ago the famous fiftyninth street New York crosstown line put 32 Treadle-ized cars into operation. Neither passengers nor crews fumbled with the new equipment—it went into service without a ripple, and an outstanding success.



NATIONAL PNEUMATIC CO.

Put these together ... and trolley worries disappear!

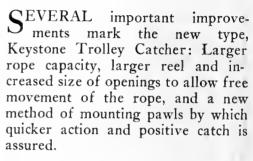


Samson Spot Trolley Cord

Samson Spot Cord is strongly recommended as the most durable and most economical trolley cord on the market. It is made of extra quality cotton yarn, is carefully inspected and is guaranteed free from all imperfections of braid or finish. It is water-proofed by a special process which makes it impervious to moisture and prevents shrinking or swelling.

Samson Spot Cord is particularly adapted for use with Keystone Trolley Catchers on account of its smoothness of braid and uniformity.

The colored spots are a trademark (registered in the U. S. Patent Office) used only with this extra quality cord.



The pawls made in one piece, are large and heavy, and so arranged that when thrown outward by centrifugal force they slide in position and secure a full flat bearing surface against the stops. This also prevents rebound of the trolley pole, causing releasing of the pawl and thus allowing the trolley pole to fly up again. "Stepping up" of the pole is further prevented due to the fact that the pawls are mounted on a rotatable plate located in the back of the machine, cushioned by a spring, which tends to reduce the shock and further eliminates the possibility of the pawls disengaging. The arrangement of the mechanism also prevents wearing of the ends of the pawls and stops.

It will pay you to get complete details.

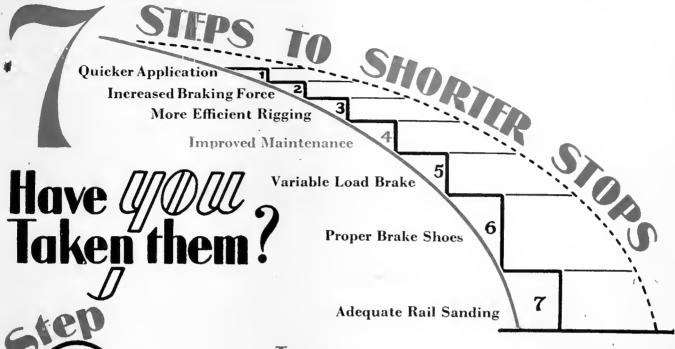




Home office and manufacturing plant located at 17th and Cambria Streets, Philadelphia, Pa.; District offices are located at 111 North Canal Street, Chicago, Ill. and 50 Church Street, Naw York City.

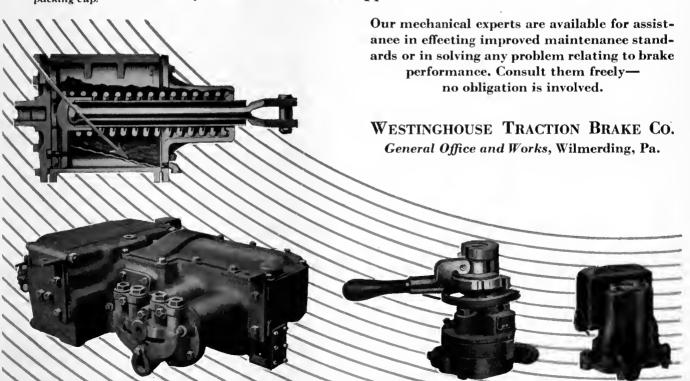
NDUSTRIAL ELECTRICAL MATERIAL

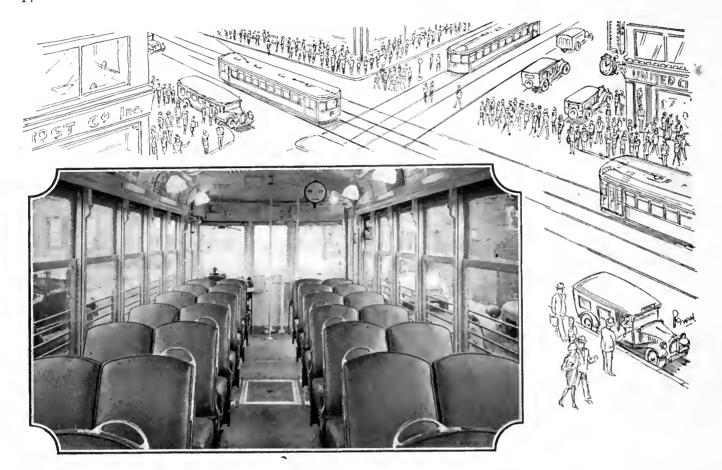
Branches—Bessamer Bldg., Pittsburgh; §3 Broad Street, Boston; General Motors Bldg., Datroit; 316 N. Washington Ave. Scranton. Canadian Agents—Lyman Tube & Supply Company, Ltd., Montreal, Toronto, Vancouver.



A simple means for reducing detrimental leakage is our Brake Cylinder Protector which prevents abrasive dirt from reaching the cylinder walls and packing cup. F prompt, effective, and consistent brake operation is to be assured, the various air brake devices must be maintained in good condition so that each will continue to function properly.

The compressor should be kept efficient to assure prompt restoration of reservoir pressure . . . governor setting periodically adjusted to keep pressure within desired limits . . . brake valve well lubricated to permit easy manipulation . . . relay valve maintained in condition to prevent sluggish action . . . pipe connections, all valve devices, and brake cylinder kept free from leakage that delays the time of brake application and reduces its effectiveness.





Don't Overlook Comfort

Progressive traction executives are stressing the advantages of trolley transportation — safety, convenience, speed, economy. They are selling rides aggressively, intelligently and, in numerous instances, effectively.

How much more effective their salesmanship would be if they could sell COMFORT! How much more eagerly would passengers choose the trolleys if they knew that comfortable chairs were waiting for them instead of the usual modified park benches!

Hale and Kilburn seats and chairs, which support the back and rest the body, are proving their value in selling urban transportation.

HALE & KILBURN SEATS

"A BETTER SEAT FOR EVERY TYPE OF MODERN TRANSPORTATION"

HALE & KILBURN COMPANY

General Office and Works: 1800 Lehigh Avenue, Philadelphia

SALES OFFICES

Hale & Kilburn Co., Graybar Bldg., New York Hale & Kilburn Co., McCormick Bldg., Chicago Frank F. Bodler, 903 Monadnock Bldg., San Francisco E. A. Thornwell, Candler Bldg., Atlanta W. L. Jefferies, Jr., Mutual Bldg., Richmond W. D. Jenkins, Praetorian Bldg., Dallas, Texas H. M. Euler, 146 N. Sixth St., Portland, Oregon



Dayton Tie Bulletin



OUR OLDEST INSTALLATION IS GOOD TODAY



efying time and traffic, the first installation of Dayton Ties we ever sold is good today. In Dubuque, Iowa (Dubuque Electric Co.) and Dubuque is buying more Dayton Ties on the strength of this experience. The engineer says the Dayton Integral Track is the best he has today.

The ties were installed in 1917 by E. M. Walker, their General Manager. Mr. Walker went from Dubuque to the Indianapolis and Eastern at Terre Haute, Ind., from there to Schenectady as general manager. In both places he introduced Dayton Integral Track on the strength of his experience in Dubuque.



aintenance has been negligible, track is good, and Dubuque has recently placed a large order for more Dayton Ties, convinced that Dayton Integral Track cannot be excelled in lasting qualities and all around satisfaction.



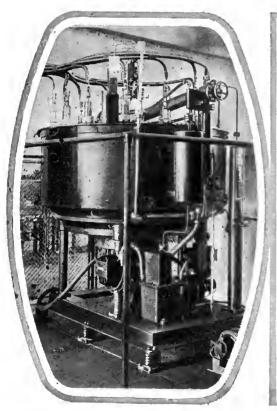
hough Dubuque was the first installation we sold—we have had experimental installations on our own lines around Dayton, O., for nearly 18 years. We feel justified in saying that the Dayton Integral System of Track and Paving Structure produces track which will last at least 20 years.

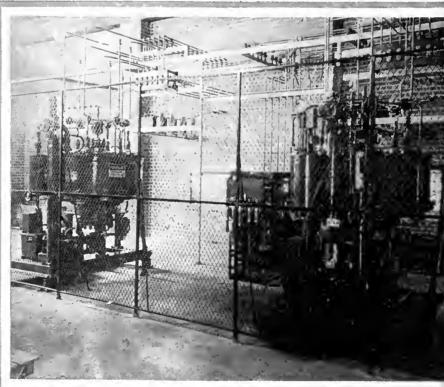
THE DAYTON MECHANICAL TIE COMPANY DAYTON, OHIO

Essential factors in converting equipment

- 1. High efficiency over the entire working range.
- 2. High capacity to absorb momentary overloads.
- 3. No synchronizing.
- 4. Simple operation and minimum attention.
- 5. Low maintenance cost.
- 6. Noiseless operation and freedom from vibration.
- 7. Reliability.

The G-E mercury-arc rectifier embodies them all.





GENERAL ELECTRIC COMPANY, SCHENECTADY, N. .Y.,



628,625 miles without repair

A G-E motor, operated by the Northern Texas Traction Company, was placed in service April 27, 1921, and was inspected April 11, 1929, after 628,625 miles of high-speed interurban service. This inspection showed the motor, including the bearings and the armature, which had never been rewound, to be in excellent condition.

Pinions, too

In April, 1929, two G-E pinions on a car operated by the Denver Tramway Corporation had operated 337,297 miles. At this time, one pinion was shifted to a different position and the other scrapped. The former pinion had .050 inch wear and the latter .120 inch.

Such service is evidence of the quality of the materials and workmanship in G-E apparatus.



JOIN US IN THE GENERAL ELECTRIC HOUR, BROAD-CAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK



ELES C TRELCES IN PRINCIPAL CITIES



Modern railless vehicles have assumed a definite place in transportation.

Of those used in city service, the trolley bus has many outstanding advantages, among which are low operating cost, unlimited power, fast acceleration, quietness, speed on grades, and flexibility. The operator of a trolley bus is not confronted with heavy paving charges.

G-E equipped trolley buses have been operated successfully for a number of years in Philadelphia, and in Cohoes and Rochester, New York; and for nearly a year in Manila.

A motion-picture film showing trolley buses in operation is available on request. Address your communications to the G-E office nearest you.



330-117
JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 8 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

Electric Railway Journal

Street Railway Journal and Electric Railway Review
A McGraw-Hill Publication—Established 1884

JOHN A. MILLER, JR., Managing Editor

Volume 73

New York, September, 1929

Number 18

An Advantage that Should Not Be Lost

In THE forefront among the serious civic problems in America today is that of traffic congestion. Everyone suffers from it to some extent. Estimates of its dollars-and-cents cost run into figures that are almost

incredible. Certainly the local transportation companies have been among the sufferers from this cause, but it has not been altogether an unmixed evil for them and the solution of the problem may not turn out to be an unmixed blessing. Although congestion has caused a serious reduction in operating speeds it also has diverted a certain amount of traffic from the private automobile to the public transportation ve-The passenger in the street car or bus has no parking worries and happily he is free from the nervous strain of driving in traffic. Numerous operating companies have emphasized these advantages in their advertising and undoubtedly many people, recognizing the truth of the argument, are now using their automobiles less than they did formerly.

Elimination of automobile parking is undoubtedly the most promising means

of relieving traffic congestion. But if such measures were to be adopted tomorrow it is a question whether the patronage occasioned by congestion would be retained by the public transportation companies, or whether these patrons would go back to their automobiles, although it involved the extra cost of using a garage instead of free parking space in the street.

Even though there might appear to be some reason to believe that the business would be lost, that is not a reason why the transportation company should oppose measures designed to relieve congestion. Such an attitude would be exceedingly short-sighted. Selfish opposition will get nowhere. Means of relieving traffic congestion will be found; in fact, some of them already are available. They await only a sufficiently aroused public opinion to insure their adoption, whether or not the transportation companies like them.

Other and better means exist for retaining the traffic that has been brought to the transportation companies by congestion. Chief among these is improvement in service. Circumstances beyond the companies' control have given them this patronage, but their keeping it will depend on their own efforts. It cannot be done

with dirty old cars running at irregular intervals over bumpy track. If, on the other hand, the company is prepared to meet the public with modern equipment run on frequent headways at a speed comparable with the demands of the public today, it is likely that not only will the present business be retained, but that even more riders can be secured.

EFFECTIVE Sept. 1 Charles Gordon, editor of ELECTRIC RAILWAY IOURNAL since 1926, becomes managing director of the American Electric Railway Association. Throughout the period of his editorship of the JOURNAL his wide experience and untiring energy have contributed greatly to the progress of the local transportation industry in this coun-The publishers of this paper feel keen regret at his leaving the post of editor and congratulate the association upon securing so capable a leader. The broad constructive policies initiated by Mr. Gordon will be continued in the future activities of the JOURNAL. After Sept. 1 responsibility for the editorial direction of the paper will be in the hands of John A. Miller, Jr., managing editor, who has been a member of the staff for seven years, following a similar period spent in actual electric railway operation.

MALCOLM MUIR,

President, McGraw-Hill Publishing Company, Inc.

Advertising Used in a New Way

NEWSPAPER advertising has been utilized for a variety of purposes by electric railways, but seldom has it been used in an endeavor to influence public sentiment regarding damage claims. Neglect of this subject in paid advertising probably has been due to the difficulty of presenting the facts in the brief space available in advertising columns, and to the danger of antagoniz-

the legal profession and the judiciary. Hazarding the possibility of unfavorable reactions which might outweigh the benefits to be derived, the Georgia Power Company recently issued a series of seven full-page advertisements frankly telling the facts of the situation. The story of the campaign is told in detail elsewhere in this issue.

Carrying the story boldly to the public, the undertaking has already been remarkably effective. Company officials sense an awakening standard of justice among those presenting and awarding claims, and company employees report increased understanding and appreciation of the service being rendered by the railway. The reaction to the advertisements has been almost wholly favorable. A large measure of the success of the series doubtless was due to reiteration that "This company will pay any just claim against it voluntarily." It asked the "same justice you would accord an individual—no more."

Changing Habits Create a Difficult Transportation Problem

MORE or less typical of the problem facing the electric railways everywhere is the situation at Boston. For some years past the total volume of riding has been declining slowly, as it has in many other cities. This has been due to the loss of off-peak business, which has suffered a marked reduction. On the other hand, rush-hour riding has been increasing steadily. Thereby an extremely difficult problem has been created.

Because the annual report of the Boston Elevated Railway is made as of June 30 the situation is prominently in the public eye just now. For the year recently closed there was a decline of \$697,000 in gross revenue. This is attributed principally to the decrease in riding on Sundays and holidays and during the summer season, when more people than formerly are going away on vacations. As a typical instance of the trend of traffic, the month of June may be cited. A year ago the revenue of the Elevated system for June exceeded the cost of service by \$179,791, but in the similar month of the present year the cost of service exceeded the revenue by \$32,188. Some loss in revenue is attributable also to the open winter last year, which encouraged the use of automobiles.

Over neither of these factors has the management any control. Over the factors which it does control, however, the figures contained in the report speak eloquently. Expenses were reduced by \$610,062—an achievement made without any apparent bad effect on the personnel or on the character of service rendered. Actually, this year, from operations there was an excess in cost of service over receipts of \$180,153. This deficit was offset in part by a dividend of \$150,700 from the Transit Mutual Insurance Company, created in 1921 to carry the workmen's compensation insurance of the Elevated. The rest of the deficit was counterbalanced by inventory and other profit and loss adjustments. In short, for the year ended June 30, 1929, the company was able to meet all operating expenses and fixed charges, but with no balance over and above the amounts necessary to restore the reserve fund to the original figure of \$1,000,000, as provided in the public control act of 1918.

That is the situation. No effort has been made to conceal it behind a screen of complicated figures. Rather, the matter has been held before the employees and the public in the frankest manner. Under public control the trustees are directed to operate the road on the basis of service at cost, fixing fares to meet the needs of the situation. An easy way to meet the problem would be to follow this arrangement to the letter, but that the management never has done. Instead of ignoring costs, constant attention has been paid to keeping them down to a minimum. Service has not been impaired but, as in a recent instance, both the public and the management have agreed to forego service that would tend to increase costs unnecessarily. At the same time special thought has been devoted to securing new business. The latest move in this direction is a newspaper advertising campaign, with the idea of inducing more people to park their automobiles at points along the rapid transit line and use the Elevated to get downtown. How this will affect the situation cannot yet be determined.

All in all, the situation at Boston is a difficult one. The vital character of the service rendered by the Elevated is shown by the increasing rush-hour traffic. This, however, only adds to the complexity of the problem

with which the management is faced. Eventually, however, the financial question will have to be solved on a basis that will preserve the transportation facilities of this great metropolitan area and permit their expansion to meet the needs of the many growing communities served.

New Evidence of Broader Thinking on Co-ordination

 ${
m M}^{
m ORE}$ and more are leaders in transportation becoming aware of the need for fully co-ordinating all transportation facilities within a city. Additional evidence of the expansion of this idea to include proper physical connection between through railroad and community local transportation facilities is furnished by the plans of the new \$40,000,000 Cincinnati Union Terminal, made public only recently. The terminal is so designed that street cars, buses and taxicabs will all pass through the building. These vehicles will enter a north wing, discharge passengers on separate platforms under shelter, and then go underneath the main building to a south wing, where they will pick up outgoing passengers, also under shelter. The plan will allow the complete segregation, not only of incoming and outgoing passengers, but also of those using the three classes of local service. Since seven steam railroads are co-operating in the construction of this terminal, the completed project will tie in almost every transportation facility of the city. It is indeed a significant move and another forward step in the advancement of complete co-ordination.

An even greater degree of co-ordination may perhaps be achieved in Cleveland, now that the Cleveland Railway has combined with the Van Sweringen interests. The plans for the new union terminal include co-ordination of the rapid transit lines and the steam railroads, as well as local street cars and buses. It is not unlikely that some agreement will be reached between the Van Sweringens and the electric interurban lines in the city to use the terminal also. Moreover, a taxicab stand has been built into the station, so that it appears that every facility will be co-ordinated.

Further evidence of the extension of the idea to include proper physical connections between the railroad and community transportation facilities is furnished by the recent revival of the Hudson River Bridge project, connecting New Jersey with New York City at 59th Street, and including a great passenger terminal on Manhattan Island. The most significant features, from the viewpoint of community transportation, are the subway freight line to extend to lower Manhattan and the underground connecting link to join this new terminal with those already built, as well as with the Hudson & Manhattan Tubes, the Ninth Avenue Elevated, Eighth Avenue Subway, Seventh Avenue Subway, Broadway Subway, Sixth Avenue Elevated, Lexington Avenue Subway and the lines to Queens. In addition the underground loop would connect six north and south street car lines, three crosstown lines, the Fifth Avenue Coach lines and most of the intercity bus terminals. In short, the system would make all of the railroad terminals accessible to people reaching the city on any rapid transit line, and conversely, would aid arriving passengers at the terminals to get to their destination. The project reveals a broad vision on the part of those who conceived it and represents an attitude toward the problem which must, of necessity, guide the planning of all great terminal

projects. Plans of this sort naturally involve many intricate physical and economic problems, but none of these is impossible of solution when the authorities realize the importance and fundamental soundness of co-ordination.

Standardization That Is Dynamic

NATIONAL industrial standardization has been advanced greatly driver. vanced greatly during the past year by the work of the American Standards Association. Building on the work of its predecessor, the American Engineering Standards Committee, the new association has so broadened the scope and improved the procedure that its first year of existence has marked a distinct step forward. As at present constituted, it is a federation of 40 national technical societies, trade associations and governmental bodies. The purpose is to bring together manufacturers, distributors, consumers, technical specialists and any others directly concerned with a particular standardization project. After being assured that a preponderance of these interests wish to have a national standard, the association brings about the organization of a technical committee composed of official delegates of all important bodies directly interested to formulate the standard. Finally, when such a committee has prepared the standard and given it substantially unanimous approval, and when the American Standards Association is definitely assured that the standard represents a real national consensus, it is made an "American standard."

Numerous branches of the federal government are participating actively in the work of the A.S.A. Six executive departments are member bodies. The Bureau of Standards was reorganized in 1927, with an assistant director in charge of the commercial standards group. This group comprises the division of simplified practice, the division of specifications and a new commercial standards unit. The last-named has for its objects the promulgation of commercial standards prepared by industry and the promotion of the use of such standards. The bureau and the A.S.A. are co-operating to prevent overlap and conflict. While the details of the arrangement between the two organizations have not been completed, it is understood that the Bureau of Standards, with the approval of a proponent group, will submit tentative standards to the A.S.A. for approval as American standards, provided there is sufficiently wide acceptance by the various industrial and technical groups concerned.

Although it is chance that places the American Electric Railway Association at the head of the alphabetical list of member bodies, it is no chance that makes it one of the leaders in the movement. The association has been one of the leaders in the new association, as it was in the predecessor organization. The association is represented on the technical committees determining no less than 50 different standards, and is sponsor of thirteen of these. It has representation in many of the activities of the A.S.A. The work of standardization thus accomplished had already proved of great benefit to the electric railway industry, even before the reorganization of this standards work. With the added prestige of the new association and the impetus that has been given to standardization and simplification by the Department of Commerce, the advantage will be more and more apparent. In this connection the slogan of the American Standards Association is significant: "Standardization is dynamic, not static. It means, not to stand still, but to move forward together."

Give the Pedestrian a Chance

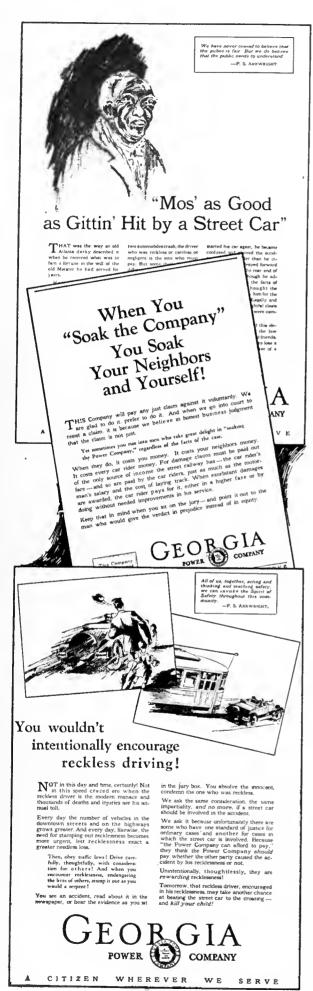
PROBLEMS of the pedestrian seldom are given the prominence they deserve in the study of metropolitan traffic problems. While the most attention ordinarily is paid to the automobile, and the street car receives some consideration, those who use the sidewalks—and, what is more important to traffic movement, the crosswalks—are allowed to shift for themselves. But no matter what is done in the way of traffic movement, the pedestrian remains a very necessary consideration. Ultimately every rider in a vehicle, public or private, must get out and walk if he is to do no more than pass through the business district. Hence facilities and protection for the pedestrian are equally as important to the rider as to the person who continually walks in the business district.

In Philadelphia the recent traffic survey, which forms the subject of an article in the JOURNAL this month, showed that of all persons crossing the street intersections those afoot outnumbered those in vehicles two to one. In fact, this survey showed that first consideration must be given the pedestrian if real traffic relief is to be obtained. With adoption of any of the various plans for elimination of parking, persons must leave their automobiles still farther from their destination than they do at present, and the ratio of walkers to riders will be even greater.

The principal source of difficulty in handling pedestrians in traffic is due to interferences. While at a few intersections the available time is insufficient to permit both vehicles and walkers to go straight across, most of these situations can be cared for by special treatment. But where many vehicles make turns—and it matters little to those crossing the street whether they are righthand or left-hand—there is bound to be the problem of movement and a hazard to life and limb that must receive the most serious thought. If the pedestrian waits for the "go" signal, as most authorities would have him do, he is likely to be confronted with what seems to be an endless stream of vehicles making turns, so that as like as not before he has had the opportunity to cross the street the signal has changed against him. Naturally he is tempted to jay-walk, and either attempts to cross against the light or to go to the middle of the block. In fact, many persons claim that it is safer to cross the street away from the intersections, solely on account of the interference caused by vehicle turns. The longer the traffic cycle the more this problem is accentuated.

Turning movements are made at one point or another by practically all vehicles. The real problem is to restrict the turns or if necessary prohibit them where they cause the greatest delay to pedestrians, and to provide vehicle routes that will result in the least interference to traffic. It requires careful analysis, and naturally there may be disagreement as to the locations at which turns should be eliminated.

An entirely different plan for the protection of pedestrians suggested in the same report advocates the construction of underground passages, either as crossings of the most congested intersections or as continuous thoroughfares. While the construction of such facilities ordinarily is expensive, the cost often is only nominal in connection with the building of subways. Sometimes it even is cheaper to leave an open gallery above a subway than to put in a back fill. Where this is possible sidewalks should be provided. Their construction in many places may well be justified.



Advertising to

Good results have been obtained by Georgia Power Company from a series of advertisements designed to show the unfairness of the "double standard" of justice which allows ordinarily conscientious people to expect excessive damages from utility interests

TREET RAILWAYS long ago learned that it pays to advertise, but even with practical proof that newspaper advertising will help sell rides, improve operating conditions and build better public understanding, the damage and claim problem is one which has received scant attention in advertising. Occasional advertisements have been published by various companies but rarely has the problem been gone into as thoroughly as in a series of newspaper advertisements used by the Georgia Power Company. The advertisements, seven in number and ranging in size from 30 to 60 in. of newspaper space, were published in daily and weekly papers in Atlanta, Macon, Augusta. Athens and Rome, Ga., where the company operates street railways, and in several other towns served by the company's interurban lines. In addition, reprints of the advertisements were mailed to a number of citizens of the various communities, and each of the advertisements was reprinted in "Two Bells," the company's publication distributed on its street cars.

Contrasts Supervision of Motormen and Auto Drivers

The first of the advertisements was built around the trainman himself and showed that he is entitled to the benefit of a doubt in any street car-auto collision, simply because he has every reason for being habitually careful, by contrast with automobile drivers who are "supervised and controlled by no one, seldom disciplined for their errors, often responsible only to themselves, and not always sober." The advertisement further stated, "The trainman cannot be careless, reckless, negligent, indifferent to the rights of others, and keep his job. The automobile driver may be all of these things, and continue driving his car through crowded streets for years."

In the second advertisement, the obvious fact was pointed out that street cars can't leave their tracks and dodge around obstacles in their path. The public was asked to remember "in ordinary fairness" that the other party, autoist or pedestrian, had to place himself on the street car's tracks before the collision could occur. The public's attention was called to the fact that frequently accidents are prevented because "street cars can and do stop quickly to save some reckless or careless person in their path from injury or death," but asked fair consideration of the accident which could not be avoided.

In another advertisement figures were used to answer any charges that the company really was to blame for the increase in automobile-street car collisions. The figures showed that

Cure Prejudice

from 1910 through 1928, accidents in this one classification increased 1,176 per cent, while the total of all other accidents was decreased 41 per cent, in the face of a greater number of car-miles traveled and passengers carried. "This trainman of yours can, and does, operate his street car safely! When you sit in judgment on him-in the jury box or as you read about an accident in the newspaper—don't you think he is entitled to the benefit of the doubt?" the advertisement asked.

Another advertisement pointed out that the jury member who decides the case in prejudice rather than on the facts, is "soaking his neighbors and himself" as well as the company, and that street railway budgets and family budgets are much alike. When an excessive jury verdict is awarded, it inevitably takes away money which otherwise might be spent in improving the service. Another made clear that the company is responsible legally only for its negligence. This advertisement was built around an old darky who remarked when he received a legacy from his Old Marster that it was "Mos' as good as gittin' hit by a street car."

Throughout the series the idea was reiterated that: "This company will pay any just claim against it voluntarily." signed statement by P. S. Arkwright, president of the company, appeared in one of the advertisements as follows: "This company will not wrong anyone intentionally. If by chance it commits a wrong, it will right it voluntarily." When necessary to submit disputed claims to the courts, the company asked "the same justice and fairness you would accord an individual, and no more."

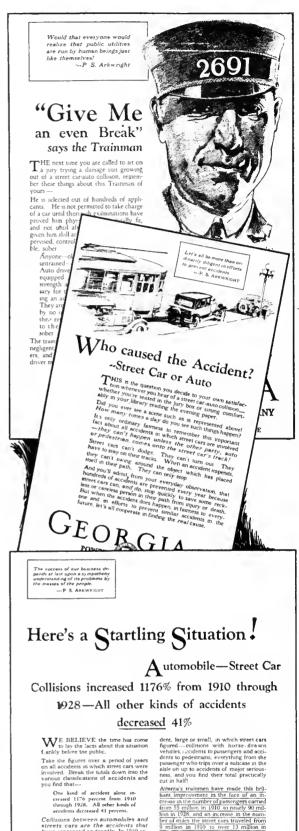
Much good has been accomplished by these advertisements by bringing about a better understanding of the problem on the part of the public and an improved spirit of fairness toward the company.

IMPROVED SPIRIT OF FAIRNESS ESTABLISHED

The direct effect of the advertising on jury verdicts is, of course, not definitely traceable, and immediate results of this sort were not expected. The purpose was to establish a basis of mutual understanding out of which an improved standing in the courts would logically flow, and officials of the company are of the opinion that this has been accomplished.

Widespread discussion and comment was caused by the advertisements. It was almost invariably favorable. Several civic clubs and similar groups took up the advertisements for discussion, and letters and other comment indicated that a large number of persons had gained a new understanding of the situation. Several officials of steam railroads and of other large corporations with a similar problem stated that the company had done a service for all of them in publishing the advertisements. Unfavorable comment was almost exclusively from "damage suit lawyers," some of whom protested to the company against continuing the series and threatened reprisals which never came.

One of the most interesting effects was that on the company's platform men who warmly approved of the series and stated that it made it easier for them to obtain the co-operation of the public in safe operation, and also easier to obtain the names of witnesses when accidents occurred. They felt that the company was "backing them up" and making their work easier by educating the public that the trainman wasn't always to blame when an accident occurred.







Small Details Important

HILE there are many factors entering into the design, construction and maintenance of a track structure, there is one extremely important factor which has been given too little attention. That factor is the importance of proper care and attention in the matter of details. This holds for every part of the track maintenance and construction organization and is not limited to any one phase. A design may be all that could be desired, but its success may be nullified by failure to give the proper

attention to details in its construction, and, through the same neglect, the life of a repair job may be materially shortened. Particularly with track in paved streets, lack of attention to seemingly unimportant details is responsible for subsequent expensive maintenance costs, and this is true also in lesser degree to open track construction.

Design—In the design, there are several questions to be considered. Is the general design the best for your conditions that your available funds can provide? Does it lend itself readily to repairs when these finally become necessary? Does it provide a maximum of

Careful attention to the matter of details necessary in track design, construction and maintenance. Inspection and follow-up system assures proper execution of work



salvage value when the time for major reconstruction arrives? Does it provide a structure that will postpone the period of general maintenance expense for the longest time? Have you covered your materials with adequate specifications which will insure you the best of their kind for the money? If these questions can be answered to your entire satisfaction, the problem of design is taken care of, but to answer them truthfully involves a knowledge, not only of what you are doing yourself but what others are doing as well

under similar conditions, and it will often be found that a page can be taken out of the other fellow's book to advantage.

Sub-grade—Assuming that the design has been taken care of satisfactorily, the next item is construction, and since the sub-grade is at the bottom of all track, it will be given first consideration. The sub-grade varies materially in its nature in different localities and frequently changes in a given stretch of track. Two things are essential with respect to sub-grade before track is constructed upon it: First, it should be well drained. Water is probably the worst enemy of the track main-

tenance organization. Second, the subgrade should be thoroughly compacted before the track is laid. Poorly compacted subsoil causes many track troubles, and the importance of thoroughly rolling the sub-grade, taking out all unsatisfactory material and replacing with material that will pack solidly, cannot be over emphasized. Of course, where subsoil conditions are of a poor character, the remedy lies in a design which will enable the entire structure to act as a unit in distributing the load over the base. This, however, generally means an increase in construction costs which would, under normal conditions, not be justified. While subsoil drains are not very effective for a protracted period in some soils, they are sometimes absolutely essential if the track structure is expected to last for any extensive period. It is often a case of choosing between two

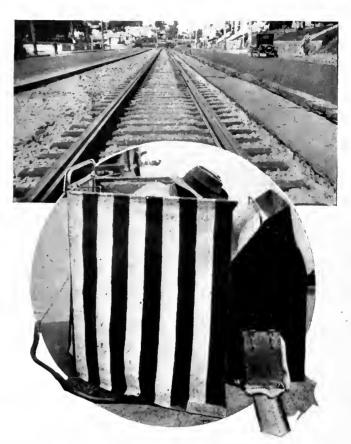
Ballast—Whether the track structure is built with wood ties on ballast or with either wood or steel ties encased in concrete, the attention to details still holds good. If stone, slag or gravel ballast is used, the main body should be rolled thoroughly before track laying is started, if possible to do so, leaving only about two inches under the tie for tamping purposes. The ballast itself should be well graded in size, so as to form, when rolled, the densest base consistent with good drainage. In no case should the ballast below the bottom of the tie be disturbed once the tamping has been completed. If the supporting base is concrete, then it is important that the proper proportioning of the aggregate be determined for the stone and sand actually used, and

in Trackwork

By
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that the water-cement ratio be accurately determined and maintained. It is also important that the mixing be thorough and uniform, and that checks be made on strength, to see that design assumptions in this respect are being met. If reinforcement is provided for in the base, it is necessary to see that it is properly placed and not disturbed during the placing of the concrete, and last, care should be taken in the placing of the concrete to see that there is no undue segregation of the aggregate. Where the supporting base and pavement base are integral, too much emphasis cannot be placed upon the necessity for careful inspection of the tamping of the concrete around ties, under rails and under any bearing plates for which the design provides.

Joint Assembly—Where wood ties and stone ballast are used, the next step is joining the rails and fastening them to the ties. These operations may seem comparatively easy of accomplishment, but they both offer ample opportunities for subsequent trouble. It is generally recognized that the subsequent life of an



Top view—The ballast should be well graded inside, so as to form, when rolled, the densest space consistent with good drainage. In circle—Since it is important to have rail joints properly welded, care should be taken in training the welders

electrically seam-welded rail joint is largely dependent upon the degree to which the gap between the rail ends is closed at the time the joint is first made. No matter how well a welding job may be done, a joint is certain to show early signs of cupping if the rail ends do not butt tightly together. This can be demonstrated by making a saw cut partly through the head of an unbroken rail at right angles to the gage, operating cars over it and observing the result. The conditions thus represented are those which would exist in a joint otherwise perfect, both electrically and mechanically.

Bolting Plates—In the assembling of joint plates care should be taken to see that both plates and rail are cleaned of all scale and rust, and that they are bolted up tightly and uniformly, to obtain the maximum wedging action in gripping the rails. Blows with a sledge are necessary to help this operation, but trackmen should never be permitted to strike a plate along its flanges in such a way as to mutilate that portion of the plate to which the seam weld is to be made. Heattreated bolts should preferably be used on all rail joints, because their high elastic limit and ultimate strength permit them to develop a much higher pressure on the plates without stretching. Whether the bolts should be left in after the welding has been completed or not may be considered as optional if the welding operation has been properly done. However, they are the best possible insurance to cover the possibility of defective welding, and their value after removal, as compared with their value in the joint, is not sufficient to justify the expense of removal. It is even desirable to spotweld all nuts as the final welding operation.

Preparing Scam for Welding—Of equal importance to the removal of scale and rust from the fishing



Screw spikes and clips used with a tie plate offer a decided advantage over the ordinary cut spike as a rail fastening device

surfaces of the rail and joint plates is the removal of all oil, grease, scale and rust from the surfaces to which the weld is to be applied. While it may be possible to obtain fairly satisfactory results by the use of a wire brush, there is only one practical way of insuring clean metal to weld on and that is by using a sand blast. This method is quick, inexpensive and thorough, and, if done just ahead of the welding crew, leaves the metal surfaces in perfect condition for welding.

Chemical Consideration—Recent experiments and tests on the seam welded type of joint have demonstrated the necessity of having a fairly ductile metal in the seam weld. The ordinary girder rail contains about 0.85 carbon, which is fairly high when weldability is considered. The destructive forces at work on a rail joint are largely of a vibratory character, and the number of repetitions is quite high. It is essential, to develop these stresses and to distribute them from the rail to the plate, that the seam metal be fairly ductile. This

means that a very low carbon rod must be used, preferably not over 0.05 carbon. If the seam weld metal is to be kept low in carbon, it is also necessary that a relatively low carbon steel be used in the joint plates, preferably from 0.20 to 0.30 carbon. The reason for this is that, under the action of the electric arc, the tendency is to draw down into the weld seam metal, carbon from the high carbon rail steel, and, if the joint plates also are relatively high in carbon, some would also be drawn into the seam metal. With a low earbon rod and a reasonably low carbon steel plate. the seam has a fairly low carbon metal of relatively high ductility which is better able to withstand the vibration stresses to which it is subject in service than would the comparatively brittle seam which would result from the use of a higher carbon plate and welding rod.

Welding conditions in the field are much less favorable than are those which prevail in a shop, and the welders should not be aggravated by introducing into the plate welds would not be aggravated by introducing into the plate welds would correct.

Training Welders—The proper training of welding operators and the frequent inspection and checking of their work by the engineer is very important. Almost every welder endeavors to follow the instructions given to him to the best of his ability, and to produce the best work he is capable of. If he is continuing with a practice that is fundamentally wrong, it can usually be attributed to lack of proper instructions or to inadequate inspection of his work by those directly responsible for such matters; but, whether poor results are attributable to faulty design or to poor workmanship can be determined with a reasonable degree of accuracy if an honest investigation and analysis of all the facts is made.



Electric tie tampers are effective in compacting the ballast material thoroughly under the ties

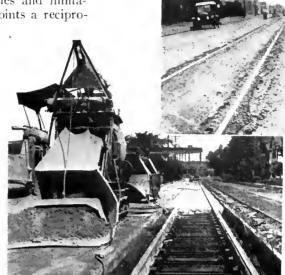
Grinding Joints—The final operation in the finishing of every rail joint is the grinding. It requires the services of carefully trained men and the best equipment available, and the men operating the machines must be thoroughly familiar with their peculiarities and limitations. With the ordinary seam-welded joints a recipro-

cating or so-called "scrubbing" type of grinder is best, as these joints generally require comparatively little grinding. In any event, this type of grinder should always be used to finish the grinding, the rotary grinder being used only for the rough grinding. The important thing, however, is that no joint, whether welded or not, should ever be put into service without grinding, and, if for any reason this is not found practicable, then the grinding should follow the joint installation within the shortest possible time. The grinding should be carefully checked with a steel straight-edge at frequent intervals during the period of the operation to see that too much metal is not being removed. It also is desirable that an attempt be made in grinding the rail head to retain as far as possible the original contour, as the grinding of a flat

surface at the joint, where the remainder of the rail-head contour is a curve, will necessarily introduce different wheel to rail contacts at these points, and consequently

change the rail-wear characteristics.

Rail and Tie Fastenings—Wood has a fairly definite, known crushing strength, and, in the design of the track structure, it is necessary that the unit loading on the wood tie be kept well within the allowable limit if rail cutting is to be prevented. This means that adequate tie plates must be used. It is for this reason that once a tie-plate size has been determined, a company should, as far as possible, use the one kind of timber in its ties, or at least take the precaution to see that no timber of lower crushing strength than that for which



Track, all lined and surfaced, and receiving a concrete base

f pavement repairs are not made promptly, small breaks soon result in spalling of the edges and disintegration of the concrete

the tie plate was designed is used.

Another important point is to draw the rail base, tie plate and tie as tightly together

as possible. It is not practical to draw the three units of the assembly so tightly together with the ordinary cut track spike that there will be no further compression under car loading, even with a sawed tie and flat tie plate, and this initial compression is exclusive of the effect which is commonly known as rail cutting. This is of equal importance in fastening rails to any form of steel tie. The fact is that no rolled surface is a plane surface, and when two rolled shapes are in contact with each other, the contact is not purely a uniform surface contact but a series of point contacts. Also, if fairly large area plates constitute the tie member to which the rail is fastened, where the thickness of the member is relatively small as compared with its surface area, the



Though a sand cushion is necessary in a block pavement to take up the inequalities in the blocks and to distribute the load uniformly over the base, it need not be very deep

surface is likely to be warped, and the probability of securing a uniform contact between the rail base and plate is practically nil. For this reason, where wood ties are used, it is highly inadvisable that a tie plate with a ribbed base be used, and, for the same reason, a sawn tie offers many advantages over a hewn tie which has not had the rail or tie plate seat adzed. If the top surface of the tie were planed, the conditions in this respect would be still further improved. This is also the reason why the screw spike and clip used with a tie plate offer such a decided advantage over the ordinary cut spike as a rail fastening device. Whatever the details of the design may be, every precaution should be taken to make sure that the fastening used has been

drawn up as tightly as its practical limitations will

permit.

Tamping-It is a well known fact that too much tamping is as bad as too little. In other words, it is easily possible to raise the entire track above grade by too much tamping. Also, the effective tamping of one tie may easily be spoiled by too much tamping on the adjacent tie. Then, too, it is quite possible to tamp a tie too much in the center, resulting in what is commonly known as a centerbound tie, which will be liable to rock under car loading and cause serious damage to both track and pavement surface.

Regarding mechanical versus hand tamping methods, it is sufficient to

say that the former offers so many advantages over the latter method that there should be no question in anyone's mind as to which is the better. Mechanical tamping permits the ballast material to be compacted thoroughly under the tie, the two tamping tools working directly opposite each other under the tie, and also offers the only solution to the problem of thoroughly tamping ballast under ties in many of the more complicated special trackwork layouts where it is necessary to interlace ties at many points and where the interlacing comes at points requiring the most efficient consolidation of the ballast under the ties. Mechanical tamping also is effective where the space between the ties available for hand tamping is very limited. Whether track is tamped by hand or by mechanical tampers, all ties should be checked carefully before proceeding with the concreting, to find those which are not seated firmly on a well-tamped bed. An experienced track man can spot all such ties easily by tapping them with a bar or sledge, a hollow sound indicating a tie that is not properly tamped.

Tierods — While there is a difference in opinion among street railway engineers regarding the necessity for tierods, it must be conceded that, as track becomes older, there is an increasing tendency toward the development of wide gage. The tie rod is the best insurance against the premature appearance of wide gage, and the results obtained more than justify the

slight expense involved. This conclusion is based on experience with track built under otherwise practically identical conditions, some of which were built with tie rod and some with tie plates but no tie rods.

Pavement-With the track lined and surfaced, and the concrete pavement base installed, there remains only the surface pavement to be considered. If this is some form of block pavement, either granite, vitrified brick or wood, a cushion is required, although a few companies make it a practice to bed their paving blocks, particularly granite, directly in the fresh concrete base. not very general practice, however. The purpose of a cushion is to take up the inequalities in the depth of the individual blocks, to provide a medium for bedding

them uniformly over their ment surface.

In laying the blocks care should be taken to make sure that all the blocks on a course are reasonably close to the

entire area and to distribute the load uniformly over the concrete base. Therefore, any greater depth of cushion than is necessary to accomplish these purposes only increases the weakness of this part of the structure, which, incidentally, is probably one of the weakest links in the pavement chain. It is the place where the water goes first when it finds its way through the pavement surface, and it is where the heaving action of freezing and thawing causes the most damage to the pave-

same width. A good paver will do this without any attention on the part of the engineer, but some pavers will not give this the attention it deserves. It is also important that joints in opposite courses be well staggered. As to the width of joints, there is, again, a difference of opinion among engineers. Some feel that these should be wide, but the general practice seems to be to keep them to the minimum consistent with the requirements for installing the filling material. With the wider joints the advantage offered in the way of getting more thorough penetration of the grout or asphalt mastic is largely offset by the difficulties encountered in keeping the blocks in position and maintaining the general surface when ramming the blocks. But whether the joints are wide or close, the ramming of the blocks should be carefully and thoroughly done, and should not be permitted to proceed close enough to the point where the blocks are being laid to disturb them. The ramming locates all improperly imbedded stone, and seats each block firmly on the cushion. If it is slighted, the result is sure to show up in early pavement failures as soon as it is subjected to heavy vehicular traffie.

Since water finds its way to the track sub-structure through openings in the surface pavement, it is essential that the best possible job be done in filling the joints between the blocks with whatever material is being used.



When cupping appears, the rail should be ground immediately; otherwise, the depressions develop into deeper ones and cause much damage

This point cannot be emphasized too strongly. Every joint should be filled and traffic kept off until the filler has set sufficiently to eliminate the possibility of damage. This means going over the grouting more than once; it means adequate protection until it has set, and also proper curing until its full strength has been developed. It is one of the details, however, attention to which means so much, and which will pay such large returns in decreased pavement maintenance expense as compared with its cost.

MAINTENANCE REQUIRES CARE ALSO

The same attention to details should be given to maintenance as has been urged for both design and construction. Whatever is worth doing at all is worth doing well. If a joint fails and requires repairs, insist that the same care be taken on the repair job as was required when the joint was first installed. Broken rails or joints with poor electrical conductivity only aggravate electrolytic troubles and should not, knowingly, be permitted to remain without attention. Where pavement repairs become necessary, do not permit any slipshod methods that would not have been tolerated in the initial installation. A slight cup in the rail head soon develops into a much deeper one and, if not taken care of promptly, may not only cause serious damage to the adjoining pavement but may even cause actual

breakage of the joint plate and the substructure as well. Small holes in the pavement can be repaired at a small expense, whereas, if they are neglected the damage soon spreads over a large area, and is often not confined to the pavement alone but affects other parts of the track structure. Cracks that may develop in concrete pavement will, if not promptly filled in with a good asphaltic mastic, soon result in bad spalling of the edges of the track and rapid disintegration of the adjoining concrete, requiring more extensive repair.

INSPECTION AND FOLLOW-UP IN THE FIELD

There should be in every track organization an inspection and follow-up service, to see that the proper attention is being paid to every detail of the work. This does not mean that a man must be detailed for every job, but it does mean that there should be someone whose duty it is to visit at frequent intervals all the work under way, and to see that the work is being properly done. It is certain that the reason why some track of a given type will last so much longer than other track of the same design under practically identical service conditions is because in one case care was taken to see that every detail was adhered to as closely as practicable, while, in the other case, the execution of the work was left entirely in the hands of the track foreman.

Fatigue in Concrete

An Element to Be Taken Into Account in Design

By

D. D. EWING

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OES the inanimate and apparently unyielding concrete that carries the myriads of feet that tread city pavements and the unending procession of wheels that roll along city streets ever become tired? If so, how is it affected by fatigue? Does it profit physically from the surcease from labor which comes when the work of men for

comes when the work of men for the day is over? It is the object of this brief article to summarize experimental knowledge which bears upon

these queries.

One does not ordinarily select concrete as a material for a spring, shaft or other moving part of a machine or structure. It might seem at first thought that the effect of repeated stresses on concrete would have little practical significance. On the other hand, concrete is becoming one of the most common of the paving and bridge materials. As such it must carry moving loads which, in their passage, cause a cycle of stress variation

Concrete, like steel, loses strength when it is subjected to repeated stresses, particularly when they are reversed. Stresses which may be repeated indefinitely may be less than half the laboratory strength

that ranges from some minimum to some maximum value. In street railway track work the important stress range would seem to be from zero to a maximum and the reversal of stresses from tension to compression would seem to be the unusual rather than the usual condition. As a pole material it might be subjected to completely reversed stresses.

How do such stresses affect the performance of concrete as a structural material? As with metals our most fruitful source of information is in the recorded researches dealing with the subject.

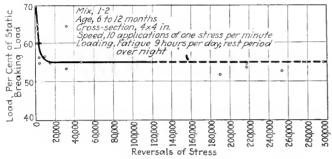
The test data and literature pertaining to concrete fatigue are not nearly so voluminous and so complete as they are with respect to fatigue in steel.

For one thing, the test specimens must be of considerable size so as to nullify the effect of small voids and large pieces of aggregate. This means that the specimens cannot be tested in small high-speed machines such as

are used in the fatigue testing of metals. The properties of concrete are affected by age, moisture and other conditions which make the fatigue testing of concrete a

rather tedious and expensive matter.

One of the pioneer investigators in this field, I. L. Van Ornum, has reported tests before the American Society of Civil Engineers on several occasions (see Transactions of the A.S.C.E., p. 443, 1903 and p. 294, 1907). His tests show that for a stress range from zero to a maximum, the endurance limit—that is, the stress which may be repeated many times without rupture-of ordinary concrete is about 50 per cent of the ultimate compressive strength as determined in the ordinary so-called "static strength" test. He also made some tests on the strength



Tests on concrete beams show effects of fatigue

The beams were made with a 1:2 mix and were 6 to 12 months old at the time of test. The cross-section was 4x4 in. The speed of testing was ten applications of one stress per minute. loading was carried out for nine hours per day with rest periods over night.

of the bond between concrete and steel. These tests showed that the average static bond strength of plain square $\frac{5}{8}$ -in. steel reinforcing rods was 150 lb. per square inch and that under repeated loads this strength was reduced to 125 lb. per square inch, a reduction of

17 per cent or an endurance ratio of 0.83.

A study of the work of other experiments leads to the conclusion that the safe probable endurance limit for bond strength is about 60 per cent of the bond strength as determined by the static test. Several observers also have noted that the modulus of elasticity of concrete decreases under repetitive loadings, the decrease being relatively rapid during the first few hundred cycles and reaching a constant value after several thousand eycles.

FAILURES INCREASE RAPIDLY WITH STRESS

The Illinois Highway Department has conducted a number of fatigue tests on concrete (Transactions of the A.S.C.E., 1924, p. 1196). In the course of these tests beams of 1:2 mortar, $1:2:3\frac{1}{2}$ and 1:3:5 concrete were tested under loads which caused the stress to vary through a range from zero to a maximum. These tests indicate that where the stresses were below 50 per cent of the ultimate strength, as determined by the static test, the stress could be repeated an indefinite number of times without failure, whereas a stress of 60 per cent caused failure in about 30,000 repetitions, and a stress of 70 per cent caused failure after approximately 5,000 repetitions. The operating tests on the Bates, Ill., test road showed that the concrete paving laid on it failed when the loads caused stresses in excess of 50 per cent of the flexural strength of the paving. Experiments made at Purdue University by W. K. Hatt (Proceedings, Highway Research Board, National Research Couneil, December, 1924) on small beams show that the endurance limit of well-aged dry concrete for stresses which

were completely reversed lies between 50 and 55 per cent of the ultimate strength. For wet concrete the endurance ratio was 37 per cent and the ultimate strength was 11 per cent lower than that of the dry

The accompanying graph sets forth the data for some of the tests on these beams. These figures are of interest to the track engineer, as wet subsoil under the track will apparently decrease materially the fatigue strength of the concrete. Also in the winter and spring, when the entire roadway is wet, the strength of the structure is considerably reduced, particularly with regard to its ability to stand up under the impacts resulting from dirt on the rails, low joints, flat wheels, etc.

It may be argued that the strength of track concrete is of no importance because the mass of material employed is so great that all unit stresses are low, even under modern vehicular and car traffic. In general this is true, but in going about over the country inspecting track one notices many points at which some local condition has caused stress concentration which, often repeated, finally produced failure.

Briefly summarized the present knowledge of the effect of repeated loads on concrete is:

1. The endurance limit of ordinary concrete is about 50 per cent of its ultimate strength as determined by the so-called static strength test.

2. When the load is such as to cause failure the deformation of the concrete continually increases until finally cracks appear

and later complete rupture occurs.

3. If the applied load is less than the endurance limit the deformation approaches a constant value or decreases, thus indi-

cating that the specimen will not fail.

4. Concrete, like steel, withstands somewhat greater repeated stresses if the test specimens are permitted to rest for definite periods. The rest period seems to be more important to concrete than it does to steel.

5. The endurance limit in concrete sometimes can be deter-

mined by as few as 20,000 cycles of stress.

6. Fatigue tests on concrete are more difficult to make than similar tests on steel, because much larger test specimens must be used and the frequency of stress repetition must be relatively low.

7. Laboratory fatigue tests in general differ from service conditions because the frequency of stress repetition is higher and the rest periods much shorter.

8. By loading test specimens under the endurance limit and later building up the load by small increments, the endurance limit can be slightly increased.

9. Wet concrete has a lower endurance limit than dry con-

10. Fatigue strength seems to increase with the richness of

the mixture. 11. The endurance limit of reinforced concrete is higher than

that of plain concrete. 12. Concrete specimens should be several months old before subjecting them to fatigue tests, in order that the test data be not vitiated by the natural gain in strength of the concrete.

Look for the Daily at the Convention

Read about the happenings of the day in

Electric Railway Journal Daily

Four issues will be published—on Monday, Tuesday, Wednesday and Thursday of Convention Week

New Equipment

Discussed at Meeting of Southern Maintenance Men

HIEF interest at the semiannual meeting of the Electric Railway Association of Equipment Men, Southern Properties, held at Lexington, Ky., July 24-26, centered on the subject of new equipment. The attendance was unusually large, more than 200 equipment men

being present from the Southern and Middle Western states. Two extremely interesting papers were presented by railway men, and several others by manufacturers'

representatives.

Re-equipment of the Kentucky Traction & Terminal Company's system with light-weight cars was the subject of a paper by F. W. Bacon, vice-president International Utilities Corporation, New York. Due to the inability of Mr. Bacon to be present at the meeting, his paper was presented by J. P. Pope, vice-president Kentucky Traction & Terminal Company, who elaborated on many of the important parts. Mr. Bacon's paper was published in the August issue of Electric Railway Journal.

R. H. Sjöberg, engineering department General Electric Company, discussed "Speed, with Comfort and Safety." Recent developments in the electrical equipment of street cars were outlined, specifically with relation to higher speed and better braking facility. E. M. O'Connor, label service department Underwriters' Laboratories, presented a paper on "The Inspection and Labeling of Electric Cars by Underwriters' Laboratories." He spoke of the advantages to the manufacturers of having their street car equipment inspected by Underwriters' Laboratories before making delivery to railway operators. This not only gives the operator the assurance that his equipment comes up to predetermined safety standards, but also safeguards the riding public from hazards incidental to inferior construction or assembling methods.

RECENT EQUIPMENT DEVELOPMENTS

On the afternoon of Wednesday, July 24, a paper was read by A. J. Manson, manager traction sales department Westinghouse Electric & Manufacturing Company. Pittsburgh, Pa., on "Recent Developments in Railway Equipment." He told of the great strides made in the recent years in the development of electric equipment, especially in connection with street railway operation. It was pointed out that the demand for high speed in railway service is now greater than some years ago, due to the effect of automobile competition. Various high-speed

Semi-annual meeting of Electric Railway Association of Equipment Men, Southern Properties, held at Lexington, Ky., Well Attended

and light-weight construction requirements which must influence the manufacturer were discussed in detail by Mr. Manson. The next paper on the program was presented by Mr. McCune of the Westinghouse Air Brake Company, Pittsburgh, Pa., on the subject "Development in

Modern Power Brake and Rapid Acceleration." This paper caused lively discussion. Members present used this occasion to obtain information as to the probable future development of the various types of brakes now in use on electric railway equipment. "New Developments in Carbon Brush Application" was the subject of a paper read by J. V. Dobson, chief engineer Stackpole Carbon Company. The characteristics of brushes were outlined in detail by Mr. Dobson, who explained the advantages and disadvantages of hard carbon and soft carbon brushes and their influence on current collection and wear on the commutator.

MAINTAINING ROLLING STOCK

An interesting paper presented by W. H. McAloney, superintendent of equipment Georgia Power Company, Atlanta, Ga., set forth the various difficulties encountered in keeping the rolling stock in first-class condition, at the same time keeping the maintenance cost down to a minimum. An abstract is published on the following page. The last paper on the program was read by T. J. Kauffeld, sales engineer De Laval Separator Company, who discussed "Reclaiming Lubricating Oils by the De Laval System." He told of the benefits which can be obtained if used oil is reclaimed by a special oil-separating equipment, enabling the operator to use oil several times instead of having to dispose of it after it has been used once only. The same procedure can be applied to waste, which can be cleaned thoroughly and be used over several times at a great saving in cost to the operator.

After all papers were read, the meeting was thrown open to discussion of a questionnaire which had been submitted previously by members of the association. The number of questions listed was 73, and it became impossible to finish the entire questionnaire. For this reason, only the most important questions were discussed before the meeting adjourned at 5 o'clock on July 25. In the evening the members gathered at a banquet at the Lafayette Hotel, with E. L. Carr, superintendent of equipment of the Kentucky Traction & Terminal Company,

acting as toastmaster.

The last session, held on Friday morning, July 26, was adjourned at 10:30, after which an inspection trip was made over the properties of the Kentucky Traction & Terminal Company. Much interest was shown in a device which lifts a car body from the trucks, lowers it and tips it over to enable repair men to work on the under side of the car while they are standing on the floor in normal position. A demonstration was given of the new magnetic track brake used by the Lexington company, and various comparative tests were made with air brake and air-magnetic brake application.

The next meeting of the Electric Railway Association of Equipment Men, Southern Properties, will be held in Birmingham, Ala., Jan. 27-29, inclusive, where it will be decided whether the semi-annual meetings will continue or only one meeting a year will be held.

Organization Cuts Maintenance Costs

 $\mathbf{B}\mathbf{y}$

W. H. McALONEY Superintendent of Equipment Georgia Power Company Atlanta, Ga.

SSUMING that the stitch-in-time theory is correct for maintenance • of electric railway equipment, to carry on that idea or any other worthwhile plan, it is necessary to have organization. Organize to the full extent so that the business in hand will stand. Of great value is personal contact, from the department head down along the line with each supervisor or foreman. It is of the utmost importance that we keep close to each man and get into working harmony with him. Another requirement is co-operation. It is difficult to get anywhere unless plans and methods are healthy and recognized as best practices under the circumstances, and unless we have united effort.

Education is now being recognized as an important factor. Individual study, or forming group classes for study, can be put across through our personal contact work, and to whatever extent systematic study can be advanced, in that proportion the quality of our work will improve. Better knowledge of their work and of their relation to other departments of a company will inspire men to give the best that is in them. Efficiency of personnel will doubtless be considered next essential, but if we have organization, personal contact, co-operation and education, then work will bring automatically the efficiency of which we hear so much of late.

In maintenance and inspection we spend about \$2 in labor for \$1 in material. Good fits, hardened surfaces, lubrication and close attention, with limit gages for getting maximum life, will help make the \$1 go farther. We should keep in touch with improved machines and methods. The line breaker is a good demonstration of the value of spending money to save money. Likewise, modern babbitt equipment and dipping and baking machinery with temperature control has been an improvement and a decided factor in reduced costs.

One of the most important things in connection with maintenance of equipment is the matter of inspection. Unless the equipment is given a rigid and definite inspection at proper intervals and necessary adjustments made, failures in service are sure to result and frequent replacements will be necessary because parts will become badly worn before having served their normal usefulness. This is bound to increase the cost of maintenance. The cost of inspection and making minor adjustments is small as compared with the total cost of labor and material in making replacements.

The campaign on noise reduction has caused us to realize the importance of a high standard of maintenance. Loose brakeshoes, gear cases, pins and bushings in brake rigging not only cause excessive noise, but result in higher costs. Special attention should be given to prevent loose bearings in axle caps and too much end play in axle collars, as this causes wear in axle caps and results in shorter life of gears, pinions and gear cases. The caps can be numbered the same as the motor in order to keep caps with the same motor to avoid pinching when renewing axle bearings. Axle collars can be of a type that extends over the flange of the axle bearing, thus increasing the life of both bearings and

Armature Maintenance Improved

The method of banding armatures has been improved with the new type tension regulator which is attached to the banding lathe. This enables the tension to be easily varied on core bands and the end bands. One of the factors in lower maintenance cost is dipping and baking of armatures, but the method of banding is a most important factor. Our present practice is to remove the bands and put a filler of some good heatresisting material, such as treated duck. under the band so that the tension of the band would be on the coil and at the

same time would be on the iron core to keep the band from becoming loose when the armature coil insulation started to shrink. Dipping and baking the armature will fill up the cracks and crevices with a thin film of varnish, which has a tendency to keep moisture from getting into the windings but is not sufficient to overcome vibration. The insulation used in the armature slots should be of a good grade with heat resisting and low shrinkage qualities, such as treated fish paper, which is also a factor in overcoming vibration.

We like to discuss our successes but hide the details of our errors. There is more to be learned from one clean, honest mistake, as a rule, than from a dozen successes. Be on the lookout for new ideas. Don't be afraid. What was considered the best method a year ago may be obsolete today. Yet it must be recognized that uniform methods, practices and parts are big factors in holding down costs.

MAKING THE WORK EASIER

The place where we work should be comfortable, well lighted, properly heated, should have good drinking water, plenty of room-and then profit is in order. Make work easier, cut down the number of back-breaking operations.

If we looked over some cars it is possible that we would find apparatus which could be discarded. For example: On a certain type of truck, we have just recently discovered that the release spring (two to the truck, four to the car) was in a good functioning location but almost impossible to get at to keep it functioning. We are now considering placing the release spring on the top rod, one end fastened to the car-body, two to

A manufacturer's representative once said that the greatest concern he had about his competitor was "that they kept him from sleeping in the daytime." On economy and performance our Southern Equipment Men's Association has been a big factor in gaining departmental cooperation and effective work on the

several properties.

It is difficult to leave the subject of economy without calling attention again to the oft-repeated importance of the foreman. He is the key man. The foreman and his men-that is teamwork. and teamwork is vitally necessary. It takes a "Heap of livin' to make a home." and it takes a heap of time and experience to know all the kinks in the trade. With experienced men and a good leader foreman who is interested in our kind of work, the maximum of economy may be looked for.

Bow Collectors

Original type of bow collector used for five years on Toronto shunters

EALIZING that there is room for improvement in the overhead trolley wheel method of current collection, the Toronto Transportation Commission, five years ago, commenced to experiment with bow type sliding current collectors and, as a preliminary experiment, all the yard shunters

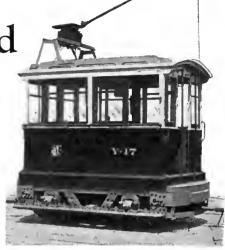
were equipped with the reversing type of bow collector, as shown in one of the illustrations. This type of collector has given fairly satisfactory results in this particular service, but the rolled aluminum collector section, with its grease groove and comparatively narrow width, was found to wear too rapidly and so did not warrant any further extension to general service operation. About a year ago a shunter, No. Y-17, was equipped with the sliding plate type of collector as shown in another illustration. The performance of this type of collector, with regard to stability and wear of the plate, was so satisfactory that it was decided to rearrange the overhead on one of the shorter and lighter traveled routes to permit testing of the plate collector in actual service. As a result of these preliminary tests, a number of cars have been equipped with the new device and placed in regular service on the Yonge Street route, which handles the heaviest traffic in the system.

The bow collector used in Toronto is fitted with a special design of sliding plate. This is shown in the illustration of the car. This plate differs from conventional types in that the contact surface proper is mounted on an axle and is free to rotate. It is held in the normal position, with contact surface horizontal, by means of a counterweight of iron tubing, which is of such shape that, in the unlikely event of the plate striking an obstruction and tilting over, it cannot be caught in the overhead. It is, therefore, possible to use a wide plate giving a large area of contact as, irrespective of the angle taken by the bow itself, the plate for its entire width is always in contact with the trolley wire. The plate itself has a total length of 39 in. and is channel section, made of

Are Developed Successfully in Toronto

After five years' experience in car yards a number of cars on the important Yonge Street line have been equipped with a new type of sliding collector developed by the staff. If successful it may be adopted for the entire system





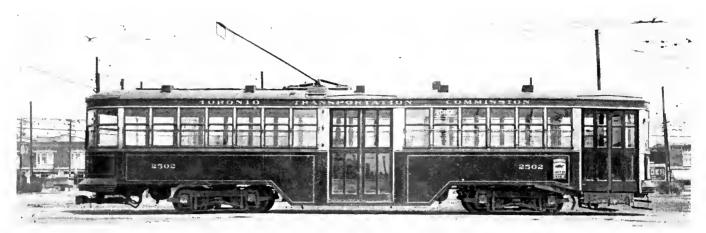
Later type of collector used for the past year with satisfactory results

14 U.S. gage sheet steel. In the center is a parallel section 24 in. long by $4\frac{3}{8}$ in. wide, and it is tapered toward each end to 1 in. wide. In relation to the horizontal it has a slight camber, the difference in height between the center and ends being about 1 in. In the wearing surface are two grease grooves run-

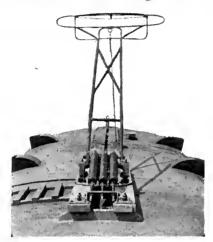
ning the full length of the parallel center section of the plate. The bow, constructed of steel tubing, is mounted on a non-swiveling base of such design that the upward pressure on the trolley wire is kept constant, irrespective of trolley wire height. In Toronto this varies from 13 ft. 6 in. at subways to 22 ft. 6 in. at railroad grade crossings.

The bow is mounted on the car in such a position that the plate itself is located directly over the king pin of the rear truck at an elevation of 18 ft. This insures that the device will describe an arc along the center line of the curve when turning at an intersection, and permits the alignment of the trolley wire to follow the center line of the track curves throughout. The mounting of the bow in this position means the minimum of alteration in the present location of the trolley wire, eliminating one of the problems during the period of transition. So far as the tangent wires are concerned, it is essential that the trolley wire be staggered on either side of the center line to a maximum of 6 in. at every fourth span in order to spread the wear on the surface of the plate.

The T.T.C. is proposing to operate these collectors under the standard trolley wire construction after making a few changes on some fixtures, such as inverting pulloffs, clearing all obstructions below the under side of the trolley wire and changing the curve dressing at intersections. The section insulators must be of the single beam type so that there is no projection below the bottom of the trolley wire. All overhead frogs in Toronto are suspended on a special device clamped over the frog pan so that no insulators project below the level of the trolley wire. The trolley frogs can be run over in their present locations. It has been necessary to fill in the clearance



Several cars on the Yonge Street line are equipped with the type of sliding plate collector illustrated



The collecting plate is mounted on an axle and is free to rotate. It is held in position by a counterweight of iron tubing



The 90 deg. overhead crossovers were redesigned to accommodate the sliding plate bow collectors by filling in the clearance gap somewhat and leveling the leads



Separate overhead contactors are used for actuating electric switches with trolley wheels and with sliding collectors

gap somewhat and level the leads on the 90 deg. cross-overs.

Additions and modifications were necessary to the electric switch overhead contactor equipment, owing to the new position of the sliding plate, as compared with the location of a trolley wheel on similar types of cars. The sliding plate is located 13 ft. forward of the trolley wheel over the center of the rear truck. It was desired



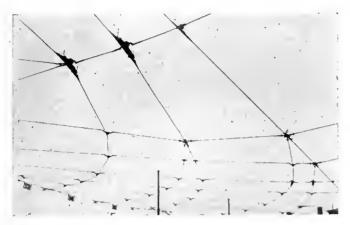
Adaptation of a double track curve for bow collection. Note that the hangers are inverted so that no part of the overhead projects beneath the plane of the contact wire

to continue operating the two types of current collectors over the same electric operated switches. To carry this out the switch contactor on the overhead for the trolley wheel was undisturbed as to location but modified so that the sliding plate in passing the contact could not in any manner cause the switch mechanism to be energized, but still be operated by the passing contact of the wheel. At a distance of 13 ft. forward another contactor was installed. It was so designed that the sliding plate in passing energizes the switch mechanism, but cannot be affected when the trolley wheel passes through it. With this special layout of contactors, as illustrated, the difficulty of operating the two types of collectors over the same electric switches has been successfully solved without any additional hazard, or diminution of safety factors.

While opinion is divided as to the relative merits of trolley wheels and sliding collectors, there certainly are features in connection with the type of sliding collector now being operated in Toronto which cannot be equalled by the wheel. The advantage that makes the heaviest score is that the upward pressure against the trolley wire is only 9 to 12 lb. as against 25 to 30 lb. with trolley wheels. Other features are the entire absence of arcing at the wire due to the large contact area and the feasibility of obtaining adequate greasing of the trolley wire.

Other advantages are that the collector cannot leave

the wire, as sometimes happens with the standard trolley wheel and pole, causing delay and annoyance, particularly in the case of one-man cars. These dewirements and their cumulative effect are frequently the direct cause of breakdown and expense on the overhead system. A feature that is important in the latitude of Toronto is



Overhead special work redesigned to permit of bow collection

that sleet will not readily form or accumulate on a wire coated with grease. If it does form it is removed easily by the sliding plate without any special devices.

At the present time it is not possible to state definitely the saving in cost of maintenance and renewals of the overhead structure with this type of current collector. But it must be apparent, with the low contact pressure of this sliding plate compared with the orthodox trolley wheel, the elimination of side wear, the ultimate abandonment of frogs in favor of a spot-welded splice, and many other such details, that the potentialities for saving maintenance costs are very great.

TrolleyOperatedTrafficSignals Prevent Delays

DELAYS to car operation caused by automatic traffic signal lights have been much reduced at one important street intersection in Louisville, Ky., by the installation of apparatus co-ordinating the lights with the movements of the cars. This apparatus consists of four trolley contactors and a relay box, which are connected with the ordinary signal lights and timing device without any change being required in the original apparatus. Overhead trolley contactors have been installed on each wire as far back from the intersection as the car will travel during the time of the red light. Leaving contactors are set at the crossing. The distance from the setting to the clearing contactor on each track constitutes a block.

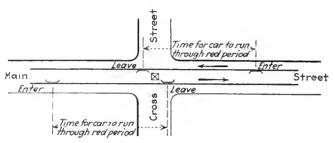
If the car is stopped by the signal at red, the control will not shorten this period, but it will prolong the green under certain conditions. In other words, the car does not change the indications at the instant of passing the entering contactor, but merely causes a prolongation of the green, if necessary. If a car enters and leaves the block within the normal green period, the special control will not be actuated, and the green will not be prolonged. This would be true if one or more cars on both tracks passed within the normal green period. The relays on the two tracks are connected as though all cars were on one track.

When the car stays in the block between the entering and leaving contactors longer than the normal green period, the traffic control causes the green display to be continued, so as to run into the next green period. This maintains the cycle without shifting it, which would be detrimental with progressive or wave systems. While this prolongation or extension may be longer than re-



Bardstown Road at the intersection of Eastern Parkway, looking east, Louisville, Ky., showing one of the Louisville Railway's new cars and trolley operated traffic signal. The relay box is on the pole at the extreme right, and the westbound clearing contactor is shown on the wire

quired for the particular car to pass, it is likely to be useful in releasing the accumulated or bottled traffic behind the car. When a car has caused a prolongation of the green, should another car enter the block at the end of the prolonged period, the green display will not be further prolonged, but the signal will change to red, permitting the cross traffic to be released. Thus if a

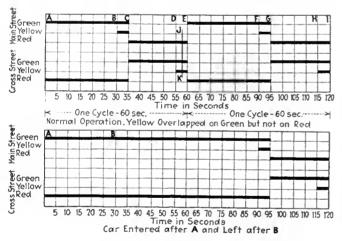


Arrangement of contactors for trolley control of traffic lights

car should for any reason stay in the block indefinitely, the green will not be held longer than one prolongation for each time the red is displayed. This places a limit on the restraint to the cross traffic.

The "Stop" and "Go" signal is at present adjusted for 25-second interval on Bardstown Road and 20-second interval on Eastern Parkway. It is possible to extend the time on Bardstown Road, on which the trolley line operates, by a complete cycle of the signal—45 seconds—thereby holding the green or "Go" period a maximum of 70 seconds.

The apparatus was furnished by the Nachod & United States Signal Company. It does not include the signal nor the timer, but only the overhead contactors and the relay box containing the relays actuated by the



Operation of Trolley Controlled Traffic Signal

A typical signal system has a traffic signal with three decks showing green, amber and red in the upper, middle and lower decks, respectively. The sequence of these indications is shown in the upper chart, and is known as the "split yellow over-lapped" system in which the yellow is over-lapped on the green at the end of the latter period, but not over-lapped on the red. For simplicity a 60 second cycle has been assumed, in which the green is displayed for 35 seconds, during the last 5 seconds of which the yellow is added; and then at the extinction of these the red is displayed for 25 seconds. The cycle then begins anew with green. The same indications are given for the cross street, but in opposing phase, the green with the red or vice versa. A vertical line JK drawn anywhere on the charts shows indications displayed to both streets at that instant. The yellow is used as a caution signal at the end of the green period to warn the moving autoist that the signal is about to go red; but no yellow is shown at the end of the red when it changes to green, so that the driver may not start on the yellow.

contactors and controlling the display of the signals in combination with the timer. There are two 600-volt d.c. relays in the trolley contactor circuit and two a.c. relays operated from the light circuit. Throwover switches are provided, so as to cut out the contactor control in case of trouble, and which permits the complete removal of the control panel. The trolley contactors are of the type without moving parts, as used in the company's standard block signal. They are non-directional, one normal-open and one normal-closed contactor being used on each track.

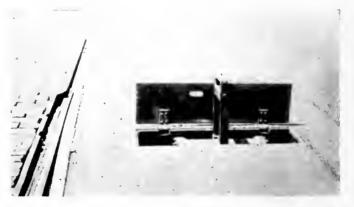
Installations of this nature are in operation also in the cities of Detroit, Mich.; Atlanta, Ga., and Pittsburgh, Pa.

Oil Buffer Eliminates Switch Tongue Slapping

By W. A. Underwood Engineer Maintenance of Way, Chicago South Shore & South Bend Railroad

Noise made by the back slapping of spring-operated tongue switch points, long a cause of complaint by Michigan City residents, has been eliminated with the installation of spring switches with oil buffer shock absorbers by the Chicago, South Shore & South Bend Railroad. Due to heavy freight movement through Michigan City, the back slap of this particular siding used to cause considerable annoyance to the nearby residents, for when a freight train of 40 cars passed through the switch, as several do each day, the former switch tongue slapped 80 times.

The apparatus used is a modification of the "Mechanical Switchman," manufactured by the Pettibone Mul-

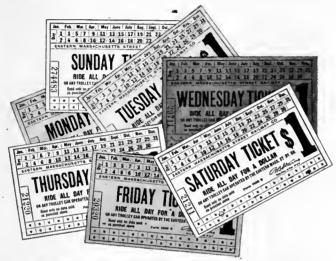


Oil-buffed spring tongue switch of the Chicago, South Shore & South Bend Railroad. Box open with manual control handle in neutral position

liken Company, of Chicago, designed for operation on sidings. When a car passes this switch, like any spring switch, the tongue normally returns to its setting. But the oil buffer retards the return of the tongue to normal position, the returning period being adjustable from six to eighteen seconds to suit conditions. This prevents the tongue slapping after the passage of each truck. When a freight train of 40 cars passes, the tongue never gets back to its normal position during the whole movement, eliminating the 80 slaps of the tongue. If it is desired to throw the points manually, the apparatus offers no resistance. The device is assembled in a cast-iron box 14 in. x 5 ft., located in the street.

Building Riding with the Dollar Pass

In AN endeavor to win back to the street car the patronage lost to the private automobile, the Eastern Massachusetts Street Railway decided to experiment with a Sunday pass selling for \$1, good on any of the company's routes on the date of purchase. Accordingly, on Sunday, July 10, 1927, this pass was made effective, and in conjunction with it, new de luxe cars with air cushion seats and other improvements were placed in service on the interurban lines. The pass caused so much favorable comment that on March 26,



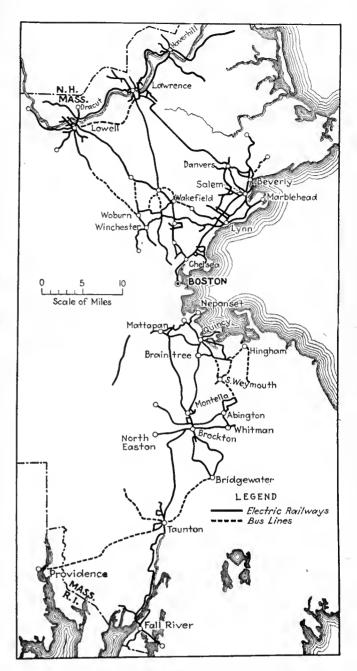
The dollar passes sold by the Eastern Massachusetts Street Railway are colored differently for each day in the week

1928, its use was extended to every day in the week with the exception of Saturday. On May 5, 1928, it was made effective on Saturdays also.

The pass is particularly attractive since it can be used on any route of the system. The company's lines serve a total of 74 cities and towns, of which 15 cities and 27 towns are north of Boston and 4 cities and 27 towns are south of Boston. Along the lines there are numerous pleasure resorts and places of amusement, as well as many points of historic and general interest. Probably the most striking feature of the ticket is that the stopover privilege is unlimited. Passengers can board and leave the car wherever they please, stay as long as they like during the day, and then board a car in any direction and ride anywhere without the payment of an additional fare.

That the \$1 all-day pass has met with the approval of the riders of the system is best shown by the volume of sales. The sales average \$2,200 a week, or approximately \$115,000 a year. The largest revenue obtained in one day was \$2,400. On the interurban routes, particularly where riding had fallen off to a very marked degree of late, there have been crowded cars in the summer and increased riding in the winter.

Aside from enabling families in the summer to enjoy a clean, cool ride at a nominal cost, with a beach, lake, grove, or other amusement place as the destination, without the inconvenience of Sunday automobile driving, these tickets allow the same people during the colder months to visit their friends in warm, comfortable trolley cars at low cost and without the dangers of winter driving. The tickets find favor with salesmen and other business people who make a series of calls daily in a city



Lines of the Eastern Massachusetts Street Railway, serving 74 cities and towns. The \$1 pass is good on any of the lines

or adjoining communities. For the person who merely desires to "see the sights" the slogan "trolley all day on a dollar bill" proves to be inviting, indeed.

When first instituted the all-day ticket was advertised for a period of thirteen weeks by a series of radio broadcasts from one of the principal Boston radio stations. The services of an excellent quartet known as "The Four Motormen" were secured, and interspersed with the songs of this quartet was a well-arranged advertising talk featuring the all-day \$1 ticket. Small inserts were placed in all the envelopes of outgoing mail inviting attention to these broadcasts. Booklets were distributed containing time-tables as well as line sketches of the more important routes. System maps and divisional time-tables folded to pocket size, containing the same information in more detail, also were made available. Extensive advertising by means of dasher signs and center rack signs carried by every car over the entire system also proved effective in stimulating sales.

Pedestrians Dominate

PHILADELPHIA'S TRAFFIC

PHILADELPHIA'S traffic problem in the central business district revolves very largely around the pedestrian, according to the report recently made to the Chamber of Commerce by Mitten Management, Inc. The report, which is the second of a series, makes a number of recommendations which, it is stated, should be advantageous to the entire community in speeding up the flow of traffic, as well as to the great majority who use the street cars and buses.

Chief among the recommendations made, as listed in the panel opposite, is revision of the existing parking ordinance. While the survey data indicate that the ordinance in general would meet conditions adequately if enforced, some concessions may be made on certain non-essential streets, while the principal streets should have their curb-space free at all times. It is recommended that parking should be prohibited between 3 a.m. and 6:30 p.m. on certain important business streets. On Market Street west of City Hall it is recommended that parking be prohibited at all times.

Signals which permit a continuous movement at a speed of 15 m.p.h. in the business district and up to 30 m.p.h. outside the business district are recommended in a separate report. Establishment of a bureau in the department of public safety, charged with the constant observation and study of city traffic conditions and with making recommendations, is urged. A traffic court and violations bureau, which has been considered by the Legislature, is unqualifiedly endorsed.

Complete co-ordination of Philadelphia's transportation facilities, which now requires only the tying in of the Broad Street subway, is recommended. It will be the subject of a subsequent report.

Construction of a concourse under City Hall and on Broad Street from Vine to Spruce, is the first step in a program of underground sidewalks for the protection and convenience of the pedestrian. Extension of these sidewalks by connecting the platforms of the Market Street subway to provide a continuous underground sidewalk from Fifth Street to Nineteenth Street is proposed. All future subways should provide for this facility, at least in the central business district.

At certain intersections in the business district the volume of pedestrian traffic greatly exceeds the vehicle turning movement. Pedestrians are inconvenienced and vehicular traffic is impeded by these movements. Elimination of all turns into and out of Market Street between Seventh and Juniper Streets, and of certain turns at other points is recommended.

With some 2,500 individuals, companies and corpora-

Report of Mitten Management shows that all traffic is impeded by the narrow streets, parked vehicles, and frequent turns of motor vehicles. Many proposals are advanced to bring relief immediately and in the future

tions in the trucking business, a large part of their operations being in the central business district, consolidation and co-ordination of these interests would result in economies, as well as reduce traffic congestion materially. Placing all vehicles engaged as common carriers under the Public Service Commission would not only provide proper control but would tend to bring about in an orderly manner a gradual merging of these interests.

Legislation is recommended providing that, in the construction of

any building in the central business district where merchandise is handled, facilities off the street be provided for the parking of vehicles carrying merchandise to and from such buildings. Legislation should further provide that within a reasonable time, say five years, all such buildings now in this district be reconstructed to provide similar facilities. Already 211 buildings are so constructed.

Rittenhouse, Washington and Franklin Squares present definite obstacles to through traffic. They should be reconstructed, so as to carry the abutting streets through or provide passages which will permit the free flow of traffic without right-angle turns. Logan Square already has been reconstructed, and the plan for Franklin Square was contained in the first report of this series. A comprehensive paving program should be adopted, which will not only care for present and future traffic needs but which will also adequately maintain and repair all existing paving. Standard uniform traffic signs and markings, in conformity with the recommended national practice, should be adopted.

Traffic control legislation should provide for the following regulations designed to relieve the traffic stream from various elements which prevent free flow: (1) Prohibit horse-drawn, slow-moving vehicles from center city streets; (2) require that coal deliveries, ash removals and all similar services in the central business district be performed outside business hours; (3) prohibit parades in central business district except on Sundays and holidays; (4) prohibit the storage of building material on the sidewalks or roadways; (5) mark definite traffic lanes on all wide streets; (6) install loading platforms for street railway passengers on all wide streets; (7) prohibit the moving of theater scenery, safes, heavy building material and similar material on all center city streets during business hours; (8) prohibit all street openings, either on the street surface or manholes, within the central business district during business hours, except in cases of emergency.

The report presents traffic conditions which are a direct

PROBLEM

result of the natural economic growth that has expanded Philadelphia to a community covering an area of 130 square miles, with a population of well over 2,000,000, and which draws daily from a normal commuting radius of 25 miles in which there is a population over 3,500,000. Probably the factor which has had the greatest influence has been the motor vehicle. There was an increase in registrations in the state of Pennsylvania from 1,246,126 vehicles in 1924 to 1,676,025 in 1928, or 34.5 per cent, while in Philadelphia there has been an increase in the same period from 168,417 to 271,347 vehicles, or 61.1 per cent. Meanwhile the population in the state has increased from 9,344,000 to 9,854,000, or 5.46 per cent, and that of Philadelphia has gone from 1,951,076 in 1924 to 2,064,200, or 5.80 per cent.

The central business district, bounded on the north by Callowhill Street, on the south by Pine Street, on the east by the Delaware River and on the west by the Schuylkill River, covers 56,810,944 sq.ft. or 2.04 square miles. Of this 11,157,574 sq.ft. (0.40 square miles) is roadway area, which is 19.6 per cent of the total, comparing with 29.5 per cent in Detroit, 29.0 per cent in Chicago and 25.0 per cent in Boston. Included in this street area are 1,648,596 sq.ft. (0.06 square miles) of unimportant disconnected streets and alleys and 380,584 sq.ft. (0.01 square miles) of roadway in street intersections.

The lineal extent of street surface is 79.52 miles, of which 25.55 miles is in the unimportant streets. The balance, 53.97 miles, includes many streets which, although narrow, are of use in moving traffic. The subdivision as to width is as follows: 20 ft. and less, 5.51 miles; 21-30 ft., 35.94 miles; 31-40 ft., 6.03 miles; 50 ft. and more, 6.49 miles. Of the total in this classification, 41.45 miles, or 76.8 per cent, are 30 ft. or less in width.

Summary of Philadelphia Recommendations

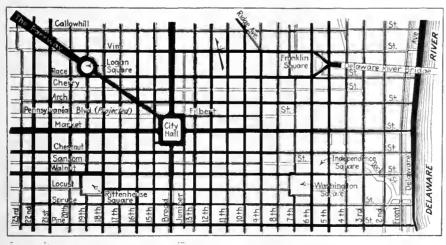
- 1. Revise existing parking ordinance.
- 2. Install signal system on main streets.
- 3. Establish a city traffic bureau.
- 4. Establish a traffic court and violations bureau.
 - 5. Completely co-ordinate transit system.
 - 6. Construct underground sidewalks.
 - 7. Eliminate many right and left-hand turns.
 - 8. Co-ordinate and control trucking.
- 9. Provide off-street loading facilities in new buildings and reconstruct old buildings within five years.
- 10. Reconstruct streets through certain squares to remove traffic obstacles.
 - 11. Adopt comprehensive paving program.
 - 12. Erect proper signs and markings.
 - 13. Miscellaneous.

To determine the traffic flow into and out of the central business district, its direction and its characteristics, a cordon count was made covering a period of several days. Table I shows the figures of this count compared with a similar count made in 1925. The change in the various classes of traffic is shown in Table II. There has been an increase in the total of 18.6 per cent.

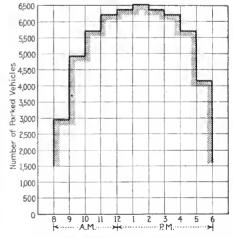
TABLE I—VEHICLES ENTERING AND LEAVING PHILADELPHIA CENTRAL BUSINESS DISTRICT, 1925-1928. TYPICAL WEEKDAYS, 5 A.M. TO 12 MIDNIGHT

	Typical	Weekday 1925		ber,	Typical	Weekday 1928		ber,
Kind of Vehicle	Enter- ing	Leaving	Total	$_{ m Cent}^{ m Per}$	Enter- ing	Leaving	Total	Per Cent
Passenger automobile Taxicabs Trucks	6,914 36,691	72,437 6,662 35,508	148,682 13,576 72,199	53.1 4.8 25.8	104,441 6,032 37,880		205,751 11,747 75,948	61.9 3.5 22.9
Horse-drawn vehicles Surface	9,971	9,907	19,878	7.1	5,824	5,455	11,279	3.4
cars* Buses	12,427 508	12,350 503	24,777 1,011	8.8 0.4	10,701 3,038	10,671 3,031	21,372 6,069	6.5 1.8
Total	142,756	143,367	280,123	100.0	167,916	164,250	332,166	100.0

^{*}Exclusive of sub-surface trolley cars



Typical weekday traffic flow in central business district of Philadelphia



Parked vehicles in main streets Jan. 7-8, 1929

TABLE II—CHANGES IN VEHICLE TRAFFIC ENTERING, AND LEAVING CENTRAL DISTRICT

Kind of Vehicle	Increase or Decrease, Per Cent	Tr	affic To a	nge in Vel and From North	tbe
Passenger automobiles	. —13.5 5.2 . —43.3 . —13.7	16.5 10.3 40.0 7.6	3. i 59. 5	-34.5 1.3 -43.7 -17.4	25.6 51.2

*No buses in 1925

TABLE 111—PASSENGERS CARRIED BY PUBLIC AND PRIVATE CONVEYANCE

Kind of Vebicle	Number of Passer November, 1925	ngers	Increase or Passengers	Decrease Per Cent
Passenger automobiles. *Taxicabs. Trucks. Horse-drawn vehicles. Surface cars. Buses. Sub-surface and elevated.	15,532 103,033 23,993 820,727 25,471	353,202 9,780 107,307 13,577 703,262 102,741 437,028	92,686 5,752 4,274 10,416 117,465 77,270 94,953	25.6 -37.0 4.1 -43.4 -14.3 304.0 27.8
Total	1,591,347	1,726,897	135,550	8.5

^{*}Taxicab drivers not included

The number of passengers carried by public and private conveyance is shown in Table III. The total number of passengers carried by mass transportation units on the street decreased from 846,198 in 1925 to 806,003 in 1928, a decrease of 40,195 or 4.8 per cent. The number carried by mass transportation, sub-surface or elevated, increased from 342,075 to 437,028, an increase of 94,953, or 27.8 per cent. The total increased 4.6 per cent. These mass transportation units carried 74.5 per cent of the total persons entering and leaving the district in 1925 and 72.2 per cent in 1928.

A similar cordon count embracing the district between Walnut and Arch Streets and the two rivers was made in 1919. A comparison of the three counts, with necessary adjustments for the difference in territory, is made in Table IV.

Summarizing the results of the cordon count, the outstanding facts are as follows: There is a daily flow into and out of the central business district of about 332,000 vehicles, or approximately 166,000 each way. This is an increase of 143 per cent during the past ten years. The principal element in the flow—the passenger automobile—increased 279 per cent and the smallest numerical element—the horse-drawn vehicle—decreased 65 per cent in the same period. From 9 a.m. to 6 p.m. the flow is fairly uniform, showing a total hourly movement of about

Comparison with the 1925 count shows the greatest change in movement has been the 127 per cent increase in flow to and from the east, due to the opening of the Delaware River Bridge. Seven streets handle 66 per cent of the traffic with North Philadelphia and 49 per cent of the traffic with South Philadelphia, the heaviest flow being on the Parkway and on Broad Street.

While the total number of passengers carried by mass transportation units on the street decreased 4.8 per cent

*Includes taxicabs

20,000 vehicles.

in 1928 from 1925, the total handled by the surface, subsurface and elevated increased 4.6 per cent, and while these services in 1925 carried 74.5 per cent of the total persons entering and leaving the district, in 1928 the proportion had dropped to 72.2 per cent.

NARROW STREETS MAKE MOVEMENT DIFFICULT

With streets that are only 26 ft. wide between curbs and carrying street car tracks in the center, the problem of movement is difficult. On account of the street car loading zones, the right-hand lane on one-way streets is of little use as a through traffic artery. Over 50 per cent of all vehicles in the narrow streets use the street car lane. Assuming a 50 per cent stop, 50 per cent go, distribution of time, the maximum capacity of such streets is 1,065 vehicles per hour. With two free lanes and a 10 per cent reduction due to unequal distribution and lag between the permissive signal and the actual movement of the vehicle, it can be assumed that the normal capacity of a free traffic lane is between 450 and 500 vehicles per hour.

A special investigation was made of Chestnut Street. A large proportion of the Chestnut Street traffic is made up of vehicles using it for only a few blocks. This is due in part to the system of one-way streets requiring vehicles to use several streets to reach their destination. Abolition of parking will not only increase the street space available for moving vehicles but will tend to reduce the number of vehicles due to elimination of the "cruising parking-space seeker." The elimination of turns into Chestnut Street would aid in reducing traffic in that street. Improved paving and complete elimination of parking in Sansom Street from Broad to Eighteenth would provide a bypass route for vehicles now making these turns.

A series of riding checks on both street cars and motor vehicles was made to determine the rate of traffic flow through the business district. It was found that on north-south streets, street car speeds range from 6.54 m.p.h. on Thirteenth to 9.79 m.p.h. on 22d over a distance of approximately one mile. On east-west streets speeds range from 5.83 m.p.h. on Walnut to 8.68 m.p.h. on Pinc. The average speed for the entire district is 6.9 m.p.h.

Distribution of the running time of street cars was found as follows:

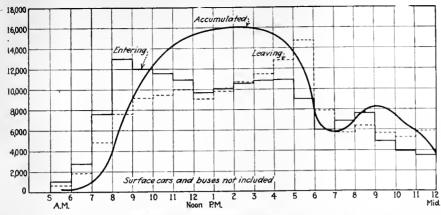
	Per Cent
Actual operation of car	70.6
Passenger stops	13.8
Delays due to cross-traffic and signals	. 13.7
Delays due to other causes	. 1.9

Thus 84.4 per cent of all time on the street is devoted to the transportation of passengers. Of the delays 88 per cent were due to cross traffic or signals.

Analysis of the automobile riding checks indicates an average over-all speed of about 9.5 m.p.h. Classification of the observed delays was as follows:

	Per Cent
Cross traffic	83.05
Congestion*	6.73
Auto or trolley loading or unloading passengers	4.47
Vehicle parking	1.99
Vehicle obstructing track	1.66
Loading or unloading merchandise	
Street repairs	0.67
Stalled vehicles	

*Delays for which the observers were unable to detect any readily apparent reason.



Count of motor and horse-drawn vehicles entering and leaving the central business district on a typical weekday

The actual time on east-west streets is divided as follows:

	Per Cent
Moving at speed greater than 5 m.p.h	67.5
Moving at speed less than 5 m.p.h	
Stopped due to cross traffic or other causes	

THREE GROUPS OF CONDITIONS AFFECT TRAFFIC FLOW

The conditions which affect traffic flow may be classified into three groups: (1) The inclusion in the traffic stream of elements which tend to hinder its flow; for example, parking, and slow-moving elements such as horse-drawn and certain types of commercial trucks; (2) those conditions which tend to impose on traffic arteries loads which are in excess of their normal carrying capacity (the most outstanding elements of this sort is the increasingly dense concentration of business and even social life in small areas, due to the construction of high buildings; (3) improper or inadequate direction and control of the traffic stream, such as faulty signal installation or lack of proper directional regulation.

Length of Time Parked, Hou	DISTRICT	Number of Vehicles Total Per Co
ess than l		23,590 72,5
-2		4.425 13.6
-3		1.693
4		812 2.3
-5		546 1.7
-6		364 1.3
-7		274 0.9
-8		280 0.8
9		307
-10		207 0.6

To determine actual parking conditions a survey covering the period from 8 a.m. to 6 p.m. was made on Jan. 7, 8, 14 and 15, 1929. A maximum of 6,523 vehicles parked between the hours of 1 and 2 p.m. An interesting comparison between 1925 and 1928 may be made by taking the accumulation of vehicles in the district obtained from the algebraic summation of the ins and outs from the cordon counts, the 1925 showing 14,200, and the 1928 count showing 16,271. The increase in accumulated vehicles for 1928 is 14.6 per cent.

In September, 1927, a parked vehicle count was made, which showed a total of 3,650 vehicles as compared with 5,462 in 1929, an increase of 50 per cent.

A summary of the parking survey shows that the

accumulated vehicles in the central business district have increased 14.6 per cent since 1925. In the district between Vine and Pine Streets, there has been an increase in parked cars of 50 per cent in the past two years. As seen in Table VI, 72.5 per cent of all vehicles parked for periods of less than one hour, and of the cars parking in excess of one hour 25.4 per cent were "repeaters," being found during both checks. The total number of vehicles using the streets for parking purposes during the business day is about 12 per cent of the city registra-These cars carry only 2 per cent of the people entering

the central business district. Repeaters or regular parkers are long-time parkers, the percentage of the total repeaters for periods of from 4-5 hours to 9-10 hours varying from 45.5 per cent to 53.9 per cent. Of all repeaters, 73 per cent are evidently regular parkers as they were found in practically the same location during both checks.

both thecks.

TABLE VI-CHECK TO DETERMINE "REPEATERS" IN PARKING

		Repes	ters
Length of Time Parked First Check, Hours	Total Number Parked, First Check	Total Number	Per Cent of Total
l-2	. 4,425	751	17.0
3-4	. 812	345 260	20.4 32.0
4 –5		202 196	36.9 53.8
6-7	. 274	133	48.5
7–8 8–9	. 280 . 307	145 140	51.8 45.6
9–10	. 207	94	45.4
Total	. 8,908	2,266	25.4

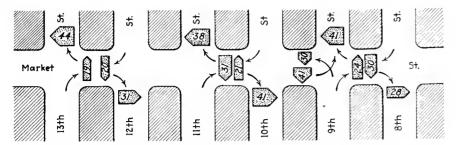
Through the co-operation of the Keystone Automobile Club, a survey of the actual garage and parking facilities was made. The summary is given in Table VII. It was noted that in certain sections of the business district there are not proper facilities for the garaging of automobiles. It is unreasonable to expect that any plan of parking regulation can be entirely successful unless suitable garaging facilities are provided, including reasonable and uniform rates. As this is a matter in which the city is directly concerned, it should encourage the construction of garages at such points throughout the city as will provide proper facilities.

Difficulties in Way of Parking Regulation

With regard to the regulation of parking, the report states:

All attempts that have been made to regulate parking in this city have met with strenuous opposition from business interests, with the claim that such regulation seriously interferes with business. It is an open question whether this claim is justified. From the experience of other cities and from such information as we have been able to secure, we are inclined to believe that this claim is based on a state of mind rather than on actual facts, and an unbiased investigation of the facts would not sustain the claim. It is certain that in other cities where there is effective parking regulation business has been helped rather than hindered, and that such regulation has brought more people, more traffic and more business to the business districts.

We secured the co-operation of a number of large and representative stores in making a three-day survey to determine facts. A total of over 56,000 customers were canvassed as to the method used in reaching the various stores, and the following tabulation



Conflicting movements of vehicles and pedestrians 8 a.m.—6 p.m. on a typical weekday in March, 1929

of transportation methods used by customers shows the percentage of the total using the means indicated.

	Per Cer
Auto parked at the curb	. 9.02
Auto not parked at the curb	8.32
Public conveyance	68.57
Walked	14.09

It will be noted that while the number of customers requiring curb parking space is considerably higher than shown by checks in other cities, yet it is a small percentage of the total and must represent a comparatively small number of the aggregate of customers using our central city shopping centers. It is doubtful whether it is to the advantage of the business houses to inconvenience the free movement of 91 per cent of their customers to provide free parking in the streets for the other 9 per cent.

A check of conditions made since the recent enforcement of the no-parking ordinance shows that while parking has not been entirely eliminated, vehicle speeds have been increased about 20 per cent. The number of parked vehicles on Chestnut and Walnut Streets has been reduced 90 per cent from the number observed during the parking survey made in January, and on north-south streets the number of parked vehicles has been reduced about 50 per cent.

Another reason for the inability of Philadelphia's streets to handle the traffic is the increasingly dense concentration of business and even social life due to the construction of high buildings. Of the buildings above ten stories in height approximately 17 per cent are 20 stories or over, 27 per cent are 15 to 19 stories and 77 per cent are 10 to 14 stories. A survey of 141 buildings in this district shows a total estimated population of 89,238 persons and a total daily traffic of 286,664 persons, or 4.4 times the population, and while the opening business hour is fairly well distributed, the closing hours are rather concentrated at 5 o'clock.

It has been estimated that during the closing hour—5 to 6 p.m.—people leave office buildings at the rate of 480 per floor, per hour. A 20-story building, therefore, discharges about 10,000. If one in 30 uses an automobile to get home, there would be required sixteen cars per floor or 320 cars for the building, or six times the number that could be parked in one city block, which would make the street impassable. Should all these people use street cars, on the basis of 100 persons per car, 100 cars would be required, which, stretched end to end, would reach almost a mile. No demonstration is necessary to

TABLE VII—GARAGE AND PARKING LOT FACILITIES COMPARED WITH PARKING ON STREET

COMPARED WITH PARKING ON STREET	
Number of parking lots	
Number of garages.	
Total available parking places Total car capacity	10
Number of cars stored.	19,
Available car space	9.
Per cent of capacity available	4
Number of cars parked on street at peak bour	6,

visualize the effect of the sudden imposition of such loads on the narrow city streets. Only high-speed sub-

surface transportation could meet such requirements, and the continuing development of this nature is a powerful argument for a completely co-ordinated and comprehensive transit system.

Observations were made of persons and vehicles entering certain selected intersections. The counts, made for an average weekday between 8 a.m. and 6 p.m., show only persons moving across the roadway and exclude those who turn the

corner and remain on the sidewalk. The distribution of the persons and vehicles was: pedestrians, 65.8 per cent; passengers in street cars and buses, 25.2 per cent; passengers in other vehicles, 9.0 per cent.

Several charts indicate the conflicting movements between pedestrians and vehicle passengers in making turns at certain intersections along Market Street. One of these is reproduced. The conflict is most noticeable at Thirteenth, Tenth and Ninth at Market, where the number of pedestrians are 44, 41 and 41, respectively, for each passenger in private vehicles making the right turn from Market to the intersecting street. It was found that a well-defined cruising circuit used by private chauffeurs exists, including Chestnut, Fifteenth, Walnut and Sixteenth Streets.

The turning movements at certain Chestnut and Market Street intersections cause serious inconvenience to the greatly predominating pedestrian movement and very definitely slow up all vehicular traffic.

OTHER SECTIONS OF THE REPORT

Other reports in the Philadelphia traffic survey already released are No. 1, which treats of the traffic conditions in the vicinity of the Delaware River Bridge Plaza: No. 3, on the traffic control signal system for the central business district, and No. 4, concerning accidents and the street traffic situation. In the first report it is recommended that Fifth Street be carried across the bridge approach through a tunnel, so that the through movements will not interfere with each other.

The third report recommends a progressive co-ordinated traffic control signal light system, which would be entirely automatic. It would be operated as a unit, controlled from one or more central points. The lights at each intersection would be so timed that a vehicle could move continuously through the district without stopping. This speed would be 15 m.p.h. on that section of Broad Street between South and Vine and at a materially higher speed beyond these limits. It is estimated that the proposed system would increase the average speed of traffic on all streets almost 50 per cent.

In the fourth report, on accidents and traffic, it is recommended among other things that a city traffic engineering bureau be organized to plan for future as well as present relief from traffic hazards and congestion; that there should be properly constituted traffic courts with adequate punishments; that further development of safety patrols and teaching of safety in the schools, and education of the police, be encouraged; that more playgrounds and other inducements to discourage play in the streets be established; that commercial vehicle movements and loading be controlled; that travel lanes and pedestrian crossings be marked; that loading platforms for street railway passengers be installed on all wide streets.



Determining the Proper Vehicle

By
GEORGE M. WOODS
Westinghouse Electric & Manufacturing Company

NE of the major problems confronting railway operators who are about to purchase new equipment is determining the type of rolling stock to buy. This question cannot be answered according to any fixed rule. There are so many variables involved that numerous exceptions can be taken to almost any general statement. The first choice must be between a rail

vehicle and a trackless vehicle, that is, between car and bus. Next, if the car is chosen, should it be articulated, multiple unit, or single unit—double truck or single truck?

In determining the proper vehicle, the traffic conditions must first be analyzed to ascertain the number of persons to be hauled at the various hours of the day. The number of cars required or the number of buses required, with their tentative schedules, must be determined. The total investment for each can then be calculated within fairly close limits. The investment must include not only the cost of the vehicles themselves, but also such items as track construction, additions

Characteristics of large and small cars, multiple-unit trains and articulated units compared, and their advantages and disadvantages under various operating conditions outlined to substation and distribution systems, garages, shop additions, etc. Generally the investment for cars and the items which accompany car operation, will exceed the investment for buses. It is equally true that the operating costs of buses per seatmile ordinarily will exceed the operating costs of street cars. If the annual fixed charges on the necessary investment are added to the

annual operating costs, the total annual charges give a true comparison of the two systems from a cost standpoint.

The earning power of cars compared with buses is another factor that must be considered. Obviously it would be poor policy to select a method of transportation merely because it is cheap, if the public would not patronize it after it had been provided. Not only the present desires of the public but also its future attitude must be considered. While this phase of the analysis approaches the realm of prophecy, it cannot be ignored. In some instances bus operation was started a number of years ago with wholly unsatisfactory vehicles; the patrons became dissatisfied and today the street car is generally

favored. But such a comparison is fundamentally unfair if modern street cars are compared with out-of-date buses. On the other hand there are numerous street railways which have purchased few new cars in recent years, while at the same time they have been consistent purchasers of modern buses. It is only natural that many persons, comparing street cars of the vintage of 1900 with buses of the vintage of 1929, consider the street car an obsolete vehicle and can see no prospect of the street railways continuing in operation. Their judgment is biased just as much as that of the people who base their opinions on old buses and modern cars. Actually there is less fundamental difference from the passenger's viewpoint between street car and bus than there is between either and the private automobile.

Wages are such a large part of the total operating expense that every effort must be made to have each man operate as large a unit as is practicable. The electric railway man is always between the "devil" of high operating costs, and the "deep sea" of infrequent service. A street railway which operates large cars at long intervals can no more expect to prosper than an office build-

weigh approximately 66,000 lb. for the same seating capacity as two single units. The electrical equipment should have the same capacity per unit of weight. In the same service the maintenance would be expected to be 4.5 cents per car-mile and the cost of energy consumption, 7.5 cents per car-mile. For the purposes of comparison let it be assumed that motormen and conductors receive 60 cents per hour on single cars, articulated cars, or multiple-mit trains and 65 cents per hour on one-man cars.

Between single cars and multiple-unit operation, there would be little difference in operating expenses, except wages of conductors and motormen. During the rush hours the headway would be doubled with the multiple-unit trains, but since the resulting headway is only four minutes. fairly frequent service is afforded. Under the conditions previously outlined, taking two-man operation of all single cars and three-man operation of multiple-unit trains, the total daily wages would be \$562 for the single cars and \$519 for the multiple-unit cars, a saving of \$43 per day for the latter.

If all cars were operated by one man during the non-



Multiple-unit cars provide a convenient means of handling light traffic during the day and heavy traffic in the rush hours

ing which would attempt to operate elevators at similarly infrequent intervals.

In considering this question, let us take for example a route with the following characteristics:

Length of line, miles p							
Schedule speed, miles							
Schedule speed, miles							9.4
Running time, minutes	-non-rush	 	 	 			90
Running time, minutes	-rush	 	 	 			96
Headway, minutes—ne	on-rush	 	 	 	 		5
Headway, minutes-ru							2
Number of cars—non-	rush	 				•	18
Number of cars—rush.							
Equivalent hours of no							
Equivalent hours of ru							3

A typical modern car for this class of service would weigh about 35,000 lb. and seat 50 passengers. This car should be maintained for not more than 2.5 cents per mile and the energy cost should be approximately 4.2 cents per mile. A car of this type could readily be arranged for train operation. The platforms and couplers might be somewhat heavier but the increase in weight is so slight that the same weight may be used for the multiple-unit car without appreciable error. An articulated car with two body sections and three trucks would

rush hours, the wages per day would be \$384 for single cars and \$341 for multiple-unit cars. The relation between single-car and multiple-unit operation remains unchanged, but a saving of \$178 per day in each case would be effected by one-man operation. If the service conditions were such that one man could run a single car successfully throughout the day, the total daily wages for single cars would be \$304. The wages for multiple-unit cars remain unchanged at \$341. Under these circumstances there would be a saving of \$37 per day for the single cars.

When the operating costs of articulated cars are compared with those of single cars and multiple-unit trains the power and maintenance expenses differ and must be included. On page 845 is a comparison based on the provision of the same number of seats throughout the day with the three types of equipment. In some instances the larger units might have to make more stops, especially during the non-rush period, than the smaller units and, hence, would make lower schedule speed and have higher energy consumption per ton-mile. This tendency is neglected in order to avoid obscuring the main point to be developed.

Under these conditions the articulated cars save

\$174 per day, compared with single cars and \$131 per day, compared with multiple-unit cars. The former, however, have the disadvantage of affording 10-minute headways during the non-rush hours instead of the 5-minute headways furnished by the latter.

If the single cars and multiple-unit cars are operated by one man during the non-rush hours the wages are reduced, as previously mentioned, to \$384 and \$341, respectively. The articulated cars remain unchanged. The total expense for wages, power and maintenance become: single cars, \$693; multiple-unit cars, \$650; articulated cars, \$697. On this basis the expenses for the articulated car are \$4 per day more than for single cars, and \$47 per day



Single-car operation under extremely heavy traffic conditions has many staunch advocates

more than for multiple-unit cars of the same capacity. Although some of the most recently designed articulated cars are arranged for three-man operation, there are a number of articulated cars in service which are operated by two men. If the latter plan is followed the expense of one man for the entire day is saved and the total cost of wages, power and maintenance of the articulated cars becomes \$555. The two-man articulated cars. therefore, save \$138 per day, compared with single cars,

and \$95 per day, compared with multiple-unit cars.

If it be assumed that the articulated car at tenminute intervals affords a service which is too infrequent, and that, in order to retain the business, maximum headways should be five minutes. the three types of cars compare as given in the table below.

On this basis the multiple-unit cars save \$295 per day, compared with the articulated cars. It so happens that in the example chosen the resulting non-rush headway, when the articulated cars provide the same number of seats as the single cars, is such that there may be a difference of opinion as to its adequacy. In some cities 10-minute headways are considered satisfactory even on important lines, in others they

> Articulated 324

are regarded as too long to meet the demands of the public.

Multiple-unit cars are the most flexible means of providing service for varied traffic conditions. Operated singly they can provide frequent service on the lighter lines during the entire day and on the heavier lines during the non-rush hours. At periods of heavy traffic, the cars can be operated in trains of two or three. In the past multiple-unit cars have been looked on with disfavor in some instances because of the assumed complication.

,							
COMPARISON OF OPERATING COSTS-	-SAME	SEATING	CAPACITY	COMPARISON OF OPERATING CO	sts-s	AME MAY	KIMUM
	Single Car	Multiple Unit	Articulated Car	HEADWAY	Single	Multiple	Articula
Car-hours per day non-rush —		324	162		Car	Unit	Car
Car-hours per day rush		144	72	Car-hours per day, non-rush	324	324	324
Wages per day non-rush		\$389	\$292	Car-hours per day, rush	144	144	72
Wages per day rush	173	130	130	Wages per day, non-rush	\$211	\$211	\$389
Total wages per day	562	519	422	Wages per day, rush	173	130	63
Car-miles per day non-rush	3,240	3,240	1,620	Total wages per day	384	341	475
Car-miles per day rush	1,355	1,355	677			3,240	3,240
Total ear-miles per day	4,595	4,595	2,297	Car-miles per day, rush	1,355	1,355	677
Cost of energy per day	\$194	\$194	\$172	Total ear-miles per day	4,595	4,595	3,917
Maintenance per day	115	115	103	Cost of energy per day	\$194	\$194	\$294
Wages, power and maintenance per day	871	828	697	Maintenance per day	115	115	176
Saving per day compared with single car oper-				Wages, power and maintenance per dry	693	650	945
ation		\$43	\$174	Excess per day compared with multiple unit	43		295



The single-truck car has a definite field of usefulness on light traffic lines

Modern remote control, however, has many advantages and there is a definite trend toward its use even for

single units.

Motor car and trailer trains are less favorably regarded at present than formerly. It has always been known that the equipment of the motor car had to be heavier and less economical in operation than if designed for the motor car alone. When the trailer is added acceleration rates are decreased and the car speed is decreased. This decrease in speed takes place just at the time when it is most important to move traffic quickly. Unmotored trailers are difficult to handle in switching operations, and equipment to move them from carhouse to line and around the carhouse must be provided. If motor troubles

occur on the car hauling a trailer, it is impractical to continue the train in service. However, the main objection to motor car and trailer trains is the fact that low rates of acceleration are too great a handicap today.

Single-car operation for almost all classes of service has many staunch advocates. Short headways can be maintained, and in these days of private automobile competition are a most effective weapon. Single cars operated by one man compare favorably in operating expenses with any other form of transportation.

In certain cities where vehicular traffic is dense and street intersections are close together, trains and articulated cars interfere with cross-street traffic. Under these conditions single cars are preferred, even if two-man crews are required.

The single-truck car has a definite field in small cities or on lightly traveled lines. Distances traveled are short and unless frequent service is available, patronage is sure to decrease. The single-truck car has never had as good riding qualities as the double-truck car, especially on poor track, and that sometimes has caused it to be unpopular. In many small cities double-truck cars, even at relatively long headways, are preferred. On some railway lines traffic has decreased or expected increases in traffic have not materialized,

and the continued operation of street cars is not economical. The track may

require high reconstruction costs. The cars also may have reached the stage where replacement is necessary. To these conditions the

trolley bus is eminently suited. The substations, a pole line and one of the trolley wires are already available. New trolley buses can be purchased more cheaply than new street

cars and the operating expenses should be about the same as those of the street car. It is possible to make theoretical studies of the investment and operating costs of each of the various types of vehicles discussed, in service of various densities.

From these studies deductions could be drawn as to the exact field of application of each type. But these studies usually ignor local conditions which quite frequently are the determining factors. No general rule can be applied to evaluate the earning power of the various vehicles. A slight change in assumptions of unit costs, changes the relative economy of various schemes. For instance, in the comparisons made between single cars, multiple-unit and articulated cars each could be shown to be most economical, depending on the number of car operators.

It is probably fortunate that definite divisions between the fields of application cannot be made. It is human nature to continue to do things in the same old way once a standard procedure is established. The urban transportation business is changing so rapidly that the industry cannot afford to over-standardize. By carefully studying each application of new equipment, the railway operator keeps in touch with new conditions and is better able to meet the requirements of the public. The best results can be obtained only by thoroughly analyzing each problem and by applying the correct vehicle.



Double-truck cars of moderate

where traffic is light

size are frequently preferred to single-truck cars,

even

Trackless trolleys involve smaller capital cost than street cars and are cheaper to operate than are motor buses

Gross Up; Expenses Down

DESPITE the advent of summer weather and the increased use of the automobile the earnings of electric railways reported for the most recent months compare quite favorably with similar reports for 1928. In the larger cities and in some of the smaller ones there is an increase of gross business. All the Canadian properties except one small one show increases in gross revenue. Approximately two-thirds of the companies for

which returns are published show a reduction in operating expense for the current year, as compared with last year, so that more than two-thirds of these companies had a higher gross income for the month reported for this year.

The statement of the Brooklyn-Manhattan Transit Corporation for the month of July is the first one issued since the consolidation of the surface lines of that com-

		Operating Expenses	Taxes	Gross Income	Net Income	Operating Operating Gross Net Revenue Expenses Taxes Income Income
Key System Transit	Co., Oakla					Brooklyn-Manhattau Transit Corporation, New York, N. Y.g
June, 1929	563,518				258,183	July, 1929 5,150,887 3,507,239 333,762 1,373,745 607,513
June, 1928 6 mo. end. June, 1929.	. 3,509,570				75,785 673,587	July, 1928
6 mo. end. June, 1928.	. 3,557,093				309,730	1928
Market Street Railw	ay, San Fra	incisco, Cal.				B.C.R.R., July, 1928 900,195 777,606 49,447 95,913 54,482
July, 1929				120,256 95,767	60,687h 33,399h	Hudson & Manhaitan Railcuad, New York, N. Y.
July, 1928	. 783,899 . 9,582,725	688,132a 8,178,553a		1,404,172	676,890h	July, 1929 985,313 510,735a 474,578 138,602 July, 1928 963,070 529,059a 434,011 98,722
12 mo. end. July, 1928.	9,857,675	8,336,388a		1,521,287	753,337h	7 mo. end. July, 1929 7 271 946 3 672 6382 3 599 308 1 247 032
Denver Tramway, De	nver, Colo.					7 mo. end. July, 1928 7,232,934 3,724,507a 3,508,427 1,159,892
6 mo. end. June, 1929.	. 2,119,250	1,441,482	247,441	455,102	196,578	Interborough Rapid Transit Co., New York, N. Y.
6 mo. end. June, 1928.	. 2,142,946	1,417,089	253,480	491,316	242,210	June, 1929 5,725,994 3,452,601 189,726 2,083,666 48,7616
Jacksonville Traction						June. 1928 5.615.504 3.535.386 208.570 1.671.622 71.676
June, 1929	90,651	74,798	8,969	6,392		12 mo. end. June, 1929. 69,735,730 42,344,462 2,393,735 24,997,532 3,007,900 12 mo. end. June, 1928. 67,502,320 39,657,346 3,200,615 24,644,359 3,021,582
June, 1928 12 mo. end. June, 1929	. 97,551 . 1,170,896	78,281 948,063	9,0 7 9 106,554	110,024	50,450	
12 mo. end. June, 1928			107,469	120,663	44,841	Long Island Railroad, New York, N. Y.
Honolulu Rapid Tra	nsit Co., H	onolulu, Ha	wali			June, 1929 June, 1928 3,567,729 2,315,696 290,663 960,305 751,017
June, 1929	. 84,625	47,694	7,932	29,999	16,776	6 mo. end. June, 1929. 19,331,691 13,573,277 978,402 4,768,190 3,838,361
June, 1928 6 mo. end. June, 1929.			15,042 58,328	27,823 172,576	22,225 93,238	6 mo. end. June, 1928. 18,776,234 14,217,879 935,715 3,617,274 2,743,642
6 mo. end. June, 1928.	533,693	315,822	68,558	155,665	109,547	New York, Westchester & Boston Ry., New York, N. Y.
Chicago Surface Line	s Chicago	T11				June, 1929 222,960 129,902 24,035 69,730 143.867
July, 1929		4,097,625a		980,345	854,219	June, 1928 201,405 134,480 19,581 47,978 149,443
July, 1928	4,963,631	3,958,992a		1,004,639	858,532	6 mo. end. June, 1929. 1,213,111 756,939 129,665 330,847 941,472 6 mo. end. June, 1928. 1,137,941 753,850 114,901 276,983 913,950
Boston Elevated Rail	way. Bosto	n. Mass.				Staten Island Rapid Transit Co., New York, N. Y.
June, 1929			130,009	662,247	32,187	June, 1929 277,571 182,262 17,000 78,303 43,321
June, 1928	2,793,329	1,867,607	78,231	854,172	179,790	June, 1928 286,707 191,773 20,000 74,401 38,025
Eastern Massachuse	tts Street B	laliway, Bost	ton, Mass	i.		6 mo. end. June, 1929. 1,455,686 1,046,519 106,000 303,150 83,583 6 mo. end. June, 1928. 1,517,120 1,085,254 122,850 308,324 86,194
June, 1929			30,658	241,557	69,138	
June, 1928 6 mo. end. June, 1929	. 714,212 4 437 489	512,376	25, 7 99 199,581	192,866	51,642 537,689	Third Avenue Railway System, New York, N. Y.
6 mo. end. June, 1928.	4,634,129	2,904,938	178,224	1,662,796	542,647	June, 1929
Boston, Worcester &	New York	Street Raily	vay, Fran	ingham,	Mass.	12 mo. end. June, 1929. 15,611,026 11,975,174 1,085,351 2,781,739 286,333
6 mo. end. June, 1929.				44,654	35,834	
6 mo. end. June, 1928.	. 340,808	308,552a		33,451	24,482	New York State Railways, Rochester, N. Y.
Middlesex & Boston	Street Rail	way, Newton	aville, Ma	ss.		6 mo. end. June, 1929. 4,750,177 3,705,810a 1,044,367 281,663, 6 mo. end. June, 1928. 5,069,678 3,942,889a 1,126,789 355,028
3 mo. end. June, 1929.				42,453	3,732 5,051	Galveston-Houston Electric Railway, Houston, Tex.
3 mo. end. June, 1928. 6 mo. end. June, 1929.	. 296,860 . 599,801			44,954 90,508	12,704	June 1979 57 314 20 174 2 545 25 27
6 mo. end. June, 1928	611,602	501,496		97,910	16,575	June, 1928 65,178 35,046 2,513 27,618
Springfield Street Ra	ilway, Spri	ngfield, Mas	85.			12 mo. end. June, 1929. 609,311 341,302 31,717 236,291 34,556
6 mo. end. June, 1929.	1,411,256			274,915	129,132	1,501
6 mo. end. June, 1928.	1,462,324		• • • • • • •	288,823	149,378	Houston Electric Co., Houston, Texas
Worcester Consolida	ted Street	Rallway, Wo	rcester, A	fass.		June, 1929 280,162 174,422 25,121 80,617 June, 1928 290,107 173,884 26,485 89,736
6 mo. end. June, 1929.	1,581,376			379,628	147,924	12 mo. end. June, 1929. 3,373,511 2,087,177 286,417 999,915 593,022
6 mo. end. June, 1928.	. 1,633,632			311,982	80,347	12 mo. end. June, 1928. 3,272,802 1,995,676 291,446 985,679 587,950
Detroit Municipal R.				= -		Pacific Northwest Traction Co., Seattle, Wash.
July, 1929		1,631,004 1,514,618	62,023 63,435	449,755 403.879	309,149 245,510	May, 1929
July, 1928	. 26,502,205	21,005,052	753,333	4,918,566	3,193,925	12 mo. end. May, 1929. 889,408 749,670 53,215 86,521 37,909
12 mo. end. July, 1928,	23,693,967	18,416,492	784,330	4,732,911	2,835,975	12 mo. end. May, 1928. 879,989 696,799 47,743 135,445 45,463
Duluth-Superior Tra	ction Co.,	Dulath, Miz	nn.			Pacific Northwest Traction Co., Scattle, Wash.
3 mo. end. June, 1929.		368,410 .		60,585	15,511	June, 1929 79,766 56,721 4,131 18,913
3 mo. end. June, 1928. 6 mo. end. June, 1929.	945,193	784,073 .		79,502 161,120	1,273 4,910	June, 1928
6 mo. end. June, 1928.				217,459	49,040	12 mn. end. June, 1928. 883,932 700,312 48,242 135,346 48,505
Kansas City Public S	Service Co	Kansas City	y, Mo.			Edmonton Radial Railway, Edmonton, Alta.
'uly 1929	714,416				48,095f	Town 1030
July, ~1928	701,495				453,356f	June, 1928 58,694 43,827 14,867 3,876
7 mo. end. July, 1929 7 mo. end. July, 1928					427,777f	6 mo. end. June, 1929. 433,763 267,541 166,226 14,133 6 mo. end. June, 1928. 406,840 266,246 140,594 1,135
International Railwa						
6 mo. eud. June, 1929.	5,451,496	4,590.513a		899,807	249,870	Lethbridge Municipal Railway, Lethbridge, Alta.
6 mo. end. June, 1928.	5,538,871	4,622,947a		934,599	240,031	May, 1929
Fonda, Johnstown &	Gloversvil	le R. R., Glo	versville.	N. Y.		5 mo. end. May, 1929. 25,535 20,168 5,367 7,561
June, 1929		80,169	7.840	52,807	17,774	5 mo. end. May, 1928. 24,769 22,752 2,017 10,908
June. 1928	. 77,118	58,448	7,840 47,040	23,427	11,201	a Includes taxes. b Net operating revenue. c Surplus (deficit) after dividend
6mo. end. June, 1929. 6mo. end. June, 1928.	516,531 546,801	388,780 383,551	47,040	148,338 152,516	46,488 $40,185$	d Before taxes. e Rentals paid for city-owned subways were \$335,606 greater in 1929. f Before depreciation. g See text. h Before depreciation and federal taxes
5 110, c.u. buile, 1720.		,			,	a source depreciation and rederat taxes

Calgary Municipal R June, 1929 June, 1928 5 mo. end. June, 1929 6 mo. eud. June, 1928	82,486 72,060 514,703	49,062 50,312		33,422	3,321
Juae, 1928 5 mo. ead. Juae, 1929	72,060 514,703	50,312			3 321
				21,747 221,091 179,793	3,077 39,293 29,264
British Columbia Ele	etric Rails	ray, Vanco	uver, B. C.		
May, 1929 May, 1928 Il mo. end. May, 1929. Il mo. end. May, 1928.	1,095,798 12,847,132	744,043 8,565,854		388,253b 351,295b 4,281,278b 3,848,996b	
London & Port Stant	ey Rallway	, London,	Ont.		
May, 1929	50,357	49,225			
May, 1928 mo. eod. May, 1929 mo. end. May, 1928	169,228 156,207			3,889b	
Hydro-Electric Railw	ays, Essex	District, T	oronto, On	ıt.	
7 mo. end. May, 1929 7 mo. eud. May, 1928			2,746 2,798	206,773 120,820	886 28,538
Regina Municipal Ra	ilway, Reg	ina, Sask.			
June, 1929 June, 1928 5 mo. end. June, 1929 5 mo. end. June, 1928	26,683 218,490	19,954 131,660		11,085 6,729 86,830 61,387	357 3,254 15,351 1,4 7 9
Saskatoon Municipa	Ratiway,	Saskatoon.	Sask.		
uae, 1929 une, 1928 mo. end. Juae, 1929 mo. end. June, 1928	26,515 23,697 203,575	18,898 17,611 129,327	1,034 958 8,024 6,930	6,583 5,139 66,224 52,097	3,051 2,038 14,750 8,895
Iavana Electric Ball	way, Havai	na, Cuba			
mo. end. Juae, 1929 mo. end. June, 1928 mo. eud. June, 1929 mo. end. June, 1928	1,486,833 1,358,009	1,161,977	3	332,718 257,171 593,610 475,270	171,754 96,112 271,673 153,247

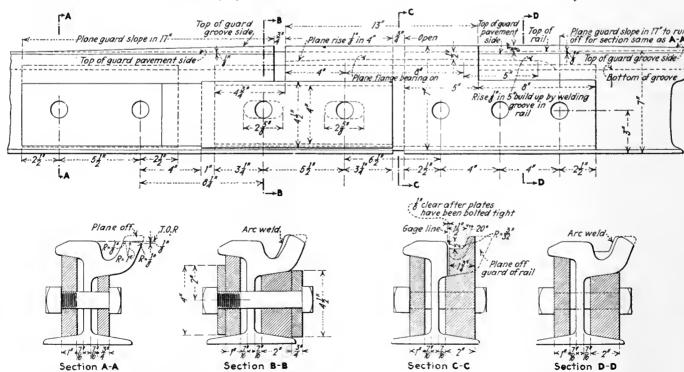
pany and the Brooklyn City Railroad into the Brooklyn & Queens Transit Corporation. The statement for the current year shows the combined results for the entire system. For purposes of comparison the results in July, 1928, for the two systems that were consolidated are shown both separately and together. Gross revenue, gross income and net income are all higher this year. The net income of \$607,513 for July, 1929 for the system includes \$99,400 accruing to minority interests in the B. & Q. T. Corporation, making a balance of \$508,113 for July, 1929, for the B.-M.T. that compares with \$507,475 net income for the B.-M.T. in July, 1928.

Flange Bearing Expansion Joint Used in Brooklyn

By H. F. MERKER

XPANSION joints have been installed at numerous locations on the lines of the Brooklyn City Railroad on bridges and approaches. Recently a joint was designed to permit expansion and contraction up to $1\frac{1}{2}$ in. and having a flange bearing at the gap in the rails. In order to provide the flange bearing, the guard was cut away and in its stead a bar of steel was used so constructed as to serve as a splice bar, a guard and a floor of the flange-way, in one piece. This bar of steel was tightly bolted to the one rail end through round holes with reamed fit bolts. On the other end the combination splice bar and guard was equipped with slotted holes similar to the accompanying splice bar on the opposite side of the rail, permitting the two splice bars to slide along the fishing space of the adjacent rail end. In order to prevent the bolts through the slotted holes from changing the 90 deg. angle which they made with the rail, a bar was provided with a set of 2 in., equivalent to the thickness of the combination splice bar and guard. This permitted one end to be bolted against the web of the rail and the other end to be bolted against the outside of the combination splice bar and guard. It was fitted with round holes in order to hold the bolts firmly in their position.

The joint as designed provided ½ in. depth of flange-way where the flange bearing was desired, and while there is little need of any riser beyond the limit of the bar, the riser or arm was continued by arc welding into the flange-way of the guard rail to which the combination piece was bolted. The joint as designed was intended to be used where car speeds are not higher than is customary over such special trackwork. It is provided with flange bearings at frog intersections. The design also contemplated welding the floor of the flange bearing groove when wear made it necessary.



Straight track expansion joint constructed by the Brooklyn City Railroad for use on lines which traverse bridges

Practices Found Useful in Expediting

Maintenance Work

in Railway Shops



This truck for welding equipment is easy to move about and requires the services of only one man under the most unfavorable conditions

Truck for Welding Equipment

ONSIDERABLE trouble was experienced in transporting the welding equipment until the truck shown in the accompanying illustration was designed and constructed in the shop of the Staten Island Rapid Transit Railway, Staten Island, N. Y. The equipment is used throughout the shop and yards on cinder and dirt paths and passes over rails and rail crossings. Metallic frame trucks with small wheels of various designs were tried out but they were found unsatisfactory. The services of two men were required to transport these trucks and often the mechanical structure did not hold together.

The truck shown is made of wood and steel. Two longitudinal members of the frame of 3x4-in. oak are spaced 21½ in. centers and tied together by means of two ¼x1½-in. angles spaced 22 in. centers. A ½x10-in. plate is riveted to each of these angles which are notched to receive the oxygen and acetylene tanks. These act as a support for the tanks. This construction takes care of any lateral motion of the tanks during transportation. The longitudinal motion is prevented by a ¾x1-in. bar bolted to the oak beams near the end.

The Maintenance Contest \$200 cash award and the departmental certificates of merit will be presented at the Tuesday morning meeting of the Engineering Association during the Atlantic City

Convention

Two iron wheels 31 in. in diameter with a rim $2\frac{1}{2}$ in. wide by $\frac{1}{2}$ in. thick are mounted on a $1\frac{1}{2}$ -in. square axle and spaced 30 in. centers.

The oak frame is 80 in, long and one end is rounded for a distance of 36 in, to provide for a suitable hand grip. The other end is beveled so that it will rest firmly on the ground. The axle is installed at about the center of gravity when the tanks are in position, and, as a result, little effort is required to maintain a balance. The oak beams are notched $1\frac{1}{2}$ in, square for the reception of the axle, and a $\frac{3}{8}$ x $1\frac{3}{4}$ -in, plate fastened to the beams across the axle holds the axle in position.

Straightening Front End Channel Irons*

By H. C. Pressler Master Mechanic Eastern Texas Electric Company, Beaumont, Tex.

A TOOL for straightening the front end channel irons, or those on the sides of street cars, was recently designed in the shops of the Eastern Texas Electric Company. This tool consists of a 6-in. jack, one piece of $1\frac{1}{4}$ in. No. 5 iron, bent 4 in. at 90 deg. at one end and 12 in. also at 90 deg. at the other end, both bends made in the same direction 26 in. apart. When a bumper is to be straightened the long end of the iron is placed behind the channel to be

*Submitted in Electric Railway Jour-NAL Prize Contest.

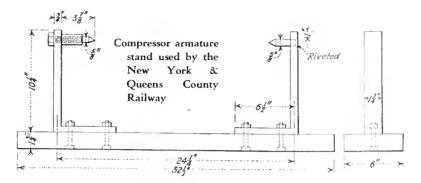


Jack for straightening bent bumpers

pulled out. The jack is placed in a horizontal position between the short end and a wooden block or bar which rests against two blocks attached to the undamaged part of the bumper. When the apparatus is in position, supported by wooden blocks, if necessary, the jack is screwed out in the conventional manner, thus straightening the bumper.

Special Winding Stand for Compressor Armatures

TO PROVIDE a special stand for compressing armatures that are not designed with a shaft extension on the commutator end, the device shown in the accompanying illustration is being used by the New York & Queens County Railway, Woodside, N. Y. This stand consists of oak



 $1\frac{3}{4}$ in. thick, 6 in. wide and $32\frac{1}{2}$ in. long, to which are bolted two angles $10\frac{1}{4}$ in. high with centers spaced $24\frac{1}{4}$ These angles are made from $\frac{3}{4}$ x $1\frac{3}{4}$ -in. steel. A supporting center $\frac{3}{8}$ in. in diameter and $2\frac{3}{4}$ in. long is riveted to one of these angles. The other angle has an adjustable supporting center $\frac{5}{8}$ in. in diameter and $\frac{5}{8}$ in. long.

Prolonging Life of Window Wiper*

By H. F. REXROTH Master Mechanic Harrisburg Railway Harrisburg, Pa.

SIMPLE device for prolonging the life of rubber windshield wipers has been devised by the Harrisburg Railway. It consists of a V-shaped hook attached to the upper window frame against which the wiper usually rests when not in use. When placing



V-shaped hook which holds window wiper off glass when not in use

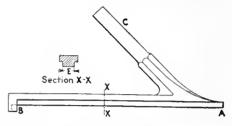
the wiper in the rest position by turning the handle upward, the wiper will be pushed over the V-shaped hook and thus will be lifted from the window. This will relieve the rubber from the continual pressure and thus preserve the flexibility necessary to wipe the water thoroughly from the windshield. It has been found that wipers consisting of five plies of rubber give better service over the uneven glass than did the single heavy piece.

Driving Tools Speed Up Armature Stick Removal*

By S. M. SPINDLE r Power Department Cleveland Railway, Cleveland, Ohio Engineer

IN THE past the electrical maintenance division of the Cleveland Railway has used several methods for driving the coil-retaining sticks when repairing large armatures. Recently this division developed a simple driver, which does the work more efshallow pocket, into which the rear formerly used.

end of the stick is placed as it is about to be driven. The distance from A to B is the length of the stick to be driven. The width E is just a trifle less than the width of the armature slot. A small air hammer is slipped over the round, case-hardened



Handy tool designed by Cleveland Railway for removing armature sticks

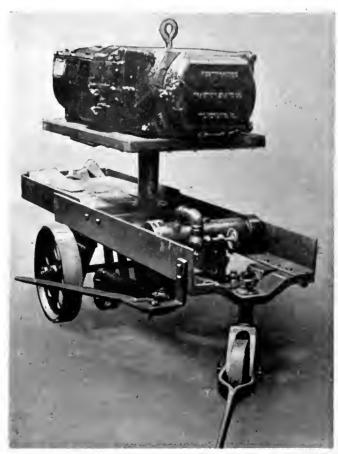
end of the tool at C. As the point of the stick is held snugly against the coil by the point A, the long flat lower surface of the tool keeps the stick from buckling. Three times as many sticks can be driven in a given period with this tool, and the resulting job fectively. This device is shown in an is more satisfactory than can be obaccompanying illustration. B is a tained from any other appliance

Portable Hydraulic Lift

By W. L. Briar Shop Supervisor Kansas City Public Service Company, Kansas City, Mo.

ONSIDER-✓ ABLE labor has been eliminated in the shops of the Kansas City Public Service Company by the use of a portable hydraulic lift. The device is used to remove and install air compressors, resistance hoxes. air tanks, brake cylinders, and other heavy equipment, when cars are in the shops for overhaul or repairs. Parts are also moved between the repair benches and the cars by the use of the same device. The lift is operated by a hand pump on the side of truck. Oil is used for

lifting.



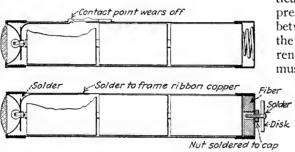
Hydraulic lift for heavy units in use by the Kansas City Public Service Company

^{*}Submitted in Electric Railway Jour-NAL Prize Contest.

Improved Switch for Flashlights*

By Farrell Tipton
Electrician San Diego Electric Railway,
San Diego, Cal.

A SIMPLE method has been devised by the Electrical Department of the San Diego Electric Railway to use a screw contact in the bottom of the case of electric flashlights instead of the sliding switch



Screw control used instead of sliding switch on electric flashlight

ordinarily used. The sliding switch is taken off the case and replaced by a piece of strip copper—the other end of which is soldered to the reflector. The tension spring in the cap of the flashlight is replaced with a fiber filler block, with a hole in the center large enough to permit the passage of a $\frac{1}{4}$ in. stove bolt. A hole is drilled through the center of the cap and a $\frac{1}{4}$ in. nut soldered to it. A disk of convenient size is soldered to a $\frac{1}{4}$ in. stove bolt, which is then used to control the light circuit through the cap.

Special Tools Speed Up Heater Installation*

By GLENN S. REEVES
Assistant Master Mechanic
Omaha & Council Bluffs Street Railway
Omaha, Neb.

AST fall electric heaters were in-✓stalled on 67 cars of the Omaha & Council Bluffs Street Railway in a remarkably short time. The heaters were placed in ducts running the full length of the car on each side, and with openings at each heater unit for the heat to escape to the inside. Each of the ducts was about 27 ft. long with ten openings the size of a heater unit. Construction of the ducts was difficult, and the work had to be done quickly. It was evident that a spot welder and sheet-iron break and punch would speed work considerably, and it was decided to construct suitable equipment in the railway shop.

*Submitted in Electric Railway Jour-NAL Prize Contest.

The spot welder contained a transformer coil which was built up from laminations salvaged from a substation transformer not in use. There were 290 primary turns made of No. 6 wire with two coil taps to vary the secondary voltage. The secondary consisted of two turns of 1x1.5-in. copper made from GE-57 motor field ribbon. Primary voltage used was 440 at 25 cycles.

Satisfactory control was particularly important since the pressure contact must be made between the electrodes before the secondary welding current flows, and the current

must be interrupted before the electrode pressure is released. If this is not done it was found that instead of making a weld the arc would burn a hole in the metal. A pedal-operated toggle switch connected with a

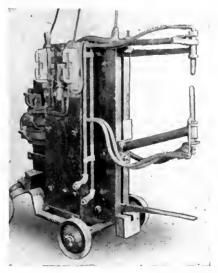
magnetic switch in the primary circuit was used for control. The toggle switch operates only after the electrodes are together and under pressure. This was made possible by the fact that the pedal is not connected directly to the movable electrode but is connected to it by means of a heavy coil spring which stretches after the electrodes are brought together and the pedal is further depressed. The bottom electrode is stationary, and both electrodes are water cooled. In the accompanying illustration the primary tap switches are shown on the opposite side from the magnetic switch. At the bottom is the pedal, and the toggle switch is operated by it when the pedal is depressed sufficiently. Through the use of this welder the work was completed six times faster

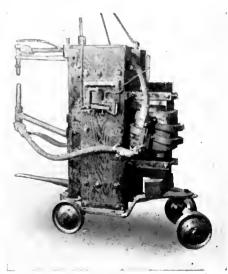


Sheet iron break and punch

and at only one-sixth of the cost. For bending and punching the long lengths of sheet iron used for the heater ducts, a special sheet-iron break and punch was constructed. The machine consists of three 10x12in. brake cylinders mounted on an A frame with a light T-rail at the top of the A reinforced by a truss. The three brake cylinder push rods attach to an inverted T-rail at the lower ends. The tread of this rail is planed to a male 90 deg. V and the tread of the stationary T-rail at the bottom of the frame is planed to a female 90 deg. V. The sheet iron to be worked is placed between the two V's. An ordinary engineer's valve controls the air.

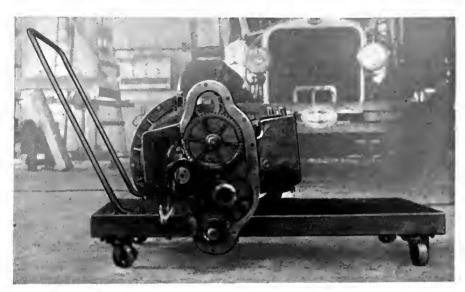
This device can be converted also into a gang punch for punching sheets up to 9 ft. long. This is done by attaching a home-made gang punch in the two V rails.





Special electric spot welder used in heater installation

Handy Devices Used in Bus Maintenance



This truck has been found convenient for transporting bus engines around the shop and has facilitated maintenance work

Rugged Hand Truck

TRANSPORTING bus parts around the shop of the Surface Transportation Company, bus subsidiary of the Third Avenue Railway, New York, N. Y., has been facilitated since the design and construction of a number of hand trucks, as shown in the accompanying illustration. The side and end framing is made from 3\frac{3}{4}x2-in. yellow pine joists and is surfaced with yellow pine planks 12 in. wide and 1 in. thick.

The length of the platform is 48 in. and the width 24 in. A swivel roller is installed on each corner of the platform. These rollers are $3\frac{1}{2}$ in. in diameter and $1\frac{3}{8}$ in. face. The height of the platform above the floor is $7\frac{1}{2}$ in. The rollers are spaced 40 in. centers on the long sides of the platform and 20 in. centers on the short

side. A U-shape handle made of $\frac{7}{8}$ -in. round iron and 40 in. long is bolted to one end of the platform.

Front Axle Assembling Stand*

By Hoy Stevens

Assistant Superintendent of Maintenance Cleveland Railway, Cleveland, Ohio

In AN overhaul shop the problem presented itself as to how to support the front axle most conveniently while various parts such as bushings, springs, steering knuckless and, in the case of newer equipment, brake shoes and diaphragms, were being assembled and adjusted. This was accomplished in a convenient manner in our shop by the stand shown in the accompanying illustration. The stand may be con-

*Submitted in Electric Railway Jour-NAL Prize Contest.

Tray.

Stand used in the Cleveland Railway garage supporting front axle during overhaul

structed so that it can be adapted to almost any make of axle. Our stand is built to fit a White Model 50 B and Safeway double-deck units. It was constructed from material on hand, which happened to be $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{3}{16}$ -in. angle iron.

The cost of the stand depends upon the material that is used and the efficiency of the labor, which, in our case, brought the expense down to a little less than \$8.

Cooling System Flushing Machine

By Del A. Smith General Manager Department of Street Railways Detroit, Mich.

FOR thoroughly flushing the radiator and cylinder block of a bus engine, the Department of Street Railways in Detroit has designed a simple but effective machine. The device consists of a 4-cu.ft. air tank, supplying air under pressure at 40 lb., against a line of water under 30 lb. pressure.

The two lines, merging into one, are directed into the radiator or engine block, forcing air and water in the direction opposite to the regular flow of the cooling system. The result



Portable flushing machine for bus engine cooling systems

is a "thumping" effect of the water, caused by a greater pressure of the air against a heavier product, loosening the sludge, scales and other foreign matter which lodged in the cooling system. This machine can be

used to advantage also in conjunction with the well-known regular "boiling process."

Mirrors Improve Pit Lighting

MIRRORS are used in the base of repair-pit light recesses in the Walden garage of the International Railway, Buffalo, N. Y. As shown in the accompanying illustration, a 1-in. plate mirror is placed directly beneath the 75-watt, inside, frosted lamp in the side-wall recess of the repair pit.

Three such recesses are spaced uniformly in each side of the pit, with



Mirror reflects upward the light of the 75-watt lamp in pit wall recess

a seventh pit light located in the shortend wall. The mirrors in these recesses reflect a large share of the available illumination upward to the underside of the bus which is run over the pit for inspection or repairs.

After experimentation 10 deg. was found to be the right angle at which to tilt the mirrors from the horizontal, to secure the maximum of reflected light. To prevent possible deterioration of the silver backing of the mirrors, a rubberized paint was applied to the cement base of each recess before the mirror was installed permanently. This system not only provides better light for the mechanics but it results in better workmanship also.

Track and Line Maintenance Practices

Track Gage Assures Exact Spacing of Rails*

By Joseph Croyle General Foreman Cleveland Railway, Cleveland, Ohio

DVANTAGES resulting from L the use of a track gage designed by the Cleveland Railway are twofold. First: the prongs conform to

Track gage designed by Cleveland Rail-way fits contour of the rail head

the contour of the rail on the gage side, thus making the proper contact between rail and instrument and insuring a true gage when the instrument is fitted snugly between the rails by the spikers. Second: the connecting bar to which the prongs are fastened is raised in order to clear the guard of all guard-rails, thereby eliminating interference and allowing the gage to rest firmly upon the rail.

The Cleveland Railway has adopted as standard on tangent track a gage of 4 ft. 8\frac{3}{8} in., and for curved track, 4 ft. $8\frac{3}{4}$ in. In order to avoid any

*Submitted in Electric Railway Jour-NAL Prize Contest.

confusion on the part of the spikers, two track gages are used: a straight track gage enameled black and a curved rail track gage enameled red. This arrangement enables the spikers to select the correct track gage immediately.

Previously, it had been the experience of this company that the spikers were unable to maintain an exact gage. The new gage was designed to use, the company has been able to brought about a marked saving in

secure track built exactly to the desired gage.

Stationary Track Department Crane*

By C. B. HALL

Chief Clerk Virginia Electric & Power Company, Norfolk, Va.

OADING and unloading of heavy L materials by means of a stationovercome this difficulty, and, by its ary crane, instead of by hand, has



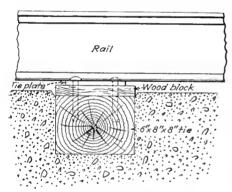
Stationary crane used in storage yard of the Virginia Electric & Power Company for handling materials resulted in a considerable saving in labor expenses, as well as a reduction in the number of accidents

the Virginia Electric & Power Company, and has also resulted in a considerable reduction of personal injury cases. The crane is equipped with a 55-ft. boom and has a lifting capacity of 3 tons at an angle of 45 deg. It is motor driven, an old GE-62 street car motor being used for this purpose, with a hand operated turning mechanism. Its cost was \$225. The crane is used for lifting heavy bridge timbers, rails, frogs, switches, scrap materials, etc., in both loading and unloading from railroad cars to the ground, and on company cars for distribution on the road. Heavy materials are now being handled at from 12 to 15 cents per ton, whereas the hand method, prior to the crane installation, usually cost \$1 per ton.

Raising Paved Track to Proper Grade*

By A. E. GLEASON Assistant Superintendent of Construction Louisville Railway

URING the last several years a considerable amount of track in Louisville has been damaged by underground work, mostly sewer construction in the business section of the city. This sewer work was carried on by tunneling from shafts, at various points, and caused the tracks to sink in a number of places from $\frac{1}{2}$ to 3 in. In most instances it was



Wood blocks on old ties used to raise track to grade

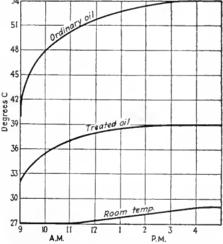
found that the entire track foundation had gone down and was solid at the new level. Because of the short headway of cars, repairs had to be made at night, and in a manner that would interfere as little as possible with traffic. Oak blocks were cut 8x12 in. ranging from $\frac{1}{2}$ to $2\frac{1}{2}$ in. in thickness. Two $\frac{1}{2}$ in. holes were bored in these blocks for spike holes, as shown in the accompanying illustra-

time and labor in the storage yard of tion. The low places in tracks were excavated to the top of ties. A block of the proper thickness with a standard tie plate bringing the rail to the proper level was placed on each tie and fastened with a long spike. Tierods were renewed where needed to hold track to gage. Concrete was placed and paving laid. In addition to the great saving in time, this method of repair saved the labor and material that would have been used had excavation been carried to bottom of ties and track tamped with concrete, as had been the practice in the past under similar circumstances.

Synchronous Converter Lubrication*

By F. W. BRAUND Superintendent of Power Conversion Cleveland Railway, Cleveland, Ohio

VER a period of years a high grade mineral oil, with a life of twelve months, has been successfully used by the Cleveland Railway in



Treated oil for converter bearings showed lower temperatures than ordinary oil in test at Cleveland

synchronous converter bearings in manually operated substations. fairly even temperature is maintained by the attendant by opening or closing doors, windows or ventilating equipment or stoking a boiler. In automatic substations, however, openings for ventilation are fewer, heating

The new Maintenance Contest will start after the annual convention in Atlantic City. Many equipment men have already indicated that they will submit contributions

equipment is unnecessary, and, with no attendant available, extremely high and low operating and room temperatures are encountered. With the installation of the automatic control, the problem arose of furnishing the bearing during summer months with a heavy viscous oil, and then removing and storing this oil in the fall in order to supply bearings with a less viscous oil for winter use.

SUMMARY OF CONVERTER BEARING TEMPERATURE TESTS

Time	Room Temper- tures, Deg. C.	Bearing Temper- ature Ordinary Oil, Deg. C.	Bearing Temper- ature Treated Oil, Deg. C.	Temper- ature Differ- ence, Deg. C.
9:00 A.M.	27	40		-
			32	8
9:15 A.M.	27	45	34	- 11
9:45 A.M.	27	47	35	12
10:00 A.M.	27	48	35.5	12.5
3:30 P.M.	28	54	39	15
4:00 P.M.	29	54	39	15
4:30 P.M.	29	54	39	iš
5:00 P.M.	29	54	39	15

Many tests were made to discover an oil the viscosity of which changed but little between temperatures of 0 deg. F. and 160 deg. F. Such an oil finally was obtained and temperature tests were made, showing an average reduction in running temperature of 15 deg. C. in favor of the new oil. This oil, a treated product containing a portion of edible tallow, will function in extreme temperatures with a viscosity change of but 2 per cent.

Reclaiming Steel Tubular Span Wire Poles

XIDIZATION at the ground level has partially destroyed some of the steel tubular span wire poles on certain lines of the Third Avenue Railway System, New York, N. Y. These are being reclaimed by means of reinforcing sleeves. A tube 30 in. long and of the proper inside diameter is split longitudinally by means of a cutting torch. The halves are clamped over the oxidized surface. These clamps are made of ₹-in. material and are 6 in. wide and 16 in.



Economical method of reclaiming span-wire poles by reinforcing sleeves

long. They are clamped together by means of $\frac{7}{8}$ -in. bolts. The splits are welded and the ends of the sleeve are welded to the pole.

^{*}Submitted in Electric Railway Jour-NAL Prize Contest.

New Products for the

New Dead-end Sling

MUTILATION of corner or dead-end poles has been eliminated through the development of a new type of dead-end sling by the American Cable Company, New York. This sling consists of a shackle and cotter-pin bolt which are



How dead-end sling is attached to post

merely steel cylinders slipped over the unseized ends of preformed wire rope, then by means of 100 tons hydraulic pressure so processed as to cold flow the steel into the interstices of the wire rope, thereby locking it to the rope with unfailing security. This new type of dead-end sling is being adopted by several public utilities and railroads.

Tap Grinder Newly Developed

DEVELOPMENT of a new manounced by the J. G. Blount Company of Everett, Mass. This machine, driven by a specially designed 1½ hp. Westinghouse type SK motor, is applied to the grinding of tap flutes by the use of a taper arbor on the end of a spindle, using various sizes of grinding wheels. For the grinding of small taps, wheels of small diameter and width are used, while, on larger taps, grinding wheels up to 6 in. in

Railways' Use

diameter and $\frac{1}{2}$ to $\frac{3}{4}$ in. wide are employed.

These grinders are self-contained, being driven by a special direct connected totally enclosed, ball-bearing motor with a speed range of 4,000 to 7,000 r.p.m. The motor is controlled by a field rheostat, so that any grinding speed may be obtained up to 7,000 r.p.m. A smooth finish can be obtained by the inherently close speed regulation of the drive.

Carbon Paste Used in Welding

WHERE missing sections of metal parts are built up by welding, the use of carbon paste, manufactured by the Oxweld Acetylene Company, New York, has been found of advantage for supporting loose pieces and making walls so that the molten metal will stay where desired. It is necessary to pack the paste tightly to give a satisfactorily smooth job, and thus save grinding or machining after the welding is completed.

The accompanying illustration shows a cast-iron support for a drill table on which carbon paste has been used to form a bottom support for welding metal. Near the center of this casting is a \(\frac{1}{4}\)-in, threaded hole for a set-screw, part of which was broken out. This hole was filled carefully and after the welding it was unnecessary to redrill the hole. When cold the carbon paste is removed easily, and the inside is of correct contour so that no finishing is necessary.



Cast-iron support for a drill table on which carbon paste is used to hold welding metal

Wheel Dolly for Removal of Bus Wheels

THE use of this new dolly for handling bus wheels is said to make a job that is ordinarily difficult and dangerous, much easier and safer with a resultant saving in time and



Taking off wheels from buses or trucks is speeded up considerably with the use of a Manley wheel dolly

labor. This bus wheel dolly has just been announced by the Manley Manufacturing Company, Bridgeport, Conn., as an addition to its complete line of garage equipment.

Non-Corrodible Resistors for Railway Service

AN EDGEWISE-WOUND, non-breakable and non-corrodible resistor, weighing about one-half as much as cast grid resistors of corresponding capacity, has been introduced by the General Electric Company. It is particularly suited to railway application where vibration and exposure tend to shorten the life of the more fragile cast grid types.

The resistor units are of unbreakable, non-corrodible ribbon rolled from special alloy. The ribbon is wound edgewise over heat-resisting and mechanically strong insulation, which is fitted over the edges of reinforced punched steel bars. The units themselves are supported on approximately 47 lb., and the fourhalf the weight of cast grid resistors.

Space is conserved by having the units elliptically shaped. The special alloy ribbon has a temperature coefficient which results in only a slight variation in resistance whether hot or cold, and the specific resistance of the alloy is extremely high, so that it is possible to use a relatively large cross-section for the conductor. Rigidity, with sufficient thermal capacity to care for abnormal conditions such as large currents on grades, pulling in dead cars, etc., is thus obtained.

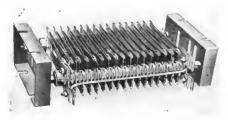
The few joints are copper to copper, affording minimum contact resistance. Terminals at the ends of the resistor frame simplify the connection of the leads, and clamp terminals for connecting intermediate turns of each unit permit accurate adjustment of each resistance step.

Any single-coil unit may be replaced without disturbing the others. Both the four-unit and six-unit resistors of the new style, known as Type EW, are interchangeable with Types CG and RG Form A and BG Form A-4 resistors, all having identically located supporting bolt holes. In many instances, however, fewer boxes are needed than are necessary with the cast grid types.

Unbreakable Resistor

UR-RISTOR, a new unbreakable resistor with a continuous resistance element, is announced by Cutler-Hammer, Inc. of Milwaukee, Wis. Designed to meet the need for a resistor which would give maximum service under the most severe operating conditions, it is vibration-proof, unbreakable, non-corrodible, light of weight and compact.

The main body of Dur-ristor the resistance element—consists of two continuous, unbreakable strips, which are made of a rust-proof, noncorrodible alloy. They are proportionally ribbed on the sides as well as



New resistor designed to meet severe operating conditions

steel rods with secondary insulation on the turning edges. A new method metal and a 3-way valve which conof mica. The six-unit resistor weighs of supporting the strips, combined with the ribbing, permits the strips unit one approximately 37 lb., about to expand and contract freely during temperature changes. The entire resistor is made unbreakable and permanent by the elimination of brittle material and by the use of mica for all insulation. All Dur-ristors, regardless of ampere rating, are of equal size. The thickness of the resistance strip is the only part that varies in size, i.e. according to ampere rating. Dur-ristor is adaptable for any standardization plan for resistor banks, and is used with equipment where minimum resistor maintainance is required.

Metal Coat Applied by Spray Gun

CONVENIENT means of ap-A plying a thin coat of metal to surfaces needing protection or resizing is offered by the Metals Coating Company of America in the form of a "MetaLayer" spray. It simultaneously melts, atomizes and



Metal in wire form fed into this gun may be sprayed on any metal or non-metallic material

applies a coating of molten metal of any desired thickness to metallic or non-metallic objects. The tool has been used to fill surface defects in castings, to build up undersize metal parts, to protect metal parts against corrosion, to apply decorative metal coatings, and for many special uses. The manufacturers claim that wood, metal, tile, pottery and even glass can be coated with the spray.

spray in the form of wire, and any of the commercial metals may be thus applied. The tool combines the following elements in it: An oxy-acetylene melting flame; a compressed air turbo-motor which feeds the metal into the flame in the wire form; a compressed air jet which atomizes the

trols the burning gases, the motor and the spray, so that all operate in unison.

Safety Starter for Shop Motors

ONTROLLED by the new Lincoln safety push button, an improved starter which starts a shop motor directly across the line has been recently placed on the market by the Lincoln Electric Com-



Starting switch and push-button control

pany, Cleveland, Ohio. Installation of the starter is simple. Only four screws are required to hold it in place. Releasing two other screws permits the contactor panel to swing out, thus making lead contacts easily accessible. A cover of the drop-hinge type incloses the entire mechanism and permits installation of starters closely grouped, a 2-in. clearance hetween starter boxes being ample for easy accessibility. Long life is assured to contact points by the wiping action, which prevents pitting, and by the cadmium plated steel shields, which provide an instantaneous thermal and magnetic quench for arcs. Arc chimneys are of heavy pressed magnesite. The relay armature has a cushion action and is provided also with replaceable bronze hearings and actuated by a coiled spring.

The Lincoln safety push button The coating metal is fed into the provides an additional safety factor to the Lincoln across the line safety starter in that the red stop button encircles and protects the green starting button, so that it is impossible to close the starting circuit unintentionally. The push button can be mounted on the side of the starter box or arranged for remote control.



A.E.R.A. Program Announced

ETAILS of the program of the 48th Annual Convention of the American Electric Railway Association now are available. The convention will be held at Atlantic City in the new municipal auditorium.

The formal sessions of the American Association will open at 10 a.m. on Monday, Sept. 30, while the sessions of the Accountants' Claims, Engineering and Transportation and Traffic Associations will begin on Tuesday afternoon. As in former vears there will be a series of luncheon conferences at which specific topics will be discussed.

The exhibit will be open beginning Saturday, Sept. 28, and will be available to delegates until noon the following Friday. Monday afternoon and Wednesday morning have been set aside for inspection of exhibits, and no meetings will be held.

Following is the program as revised up to the time of going to press.

American Association

Monday, Sept. 30, 10 a.m. Auditorium Ball Room, Second Floor

JAMES P. BARNES, Chairman

General Subject—Today's Transit Task

Welcome.

Address of the President — James P. Barnes, president Louisville Railway, Louisville, Ky.

Report—Managing Director Charles Gordon, American Electric Railway Association, New York, N. Y.

Revision of Constitution and By-Laws.

"At the Public's Service," by W. L. Will-kie, general counsel Northern Ohio Power & Light Company, Akron, Ohio.

"Better Cars and Buses," by M. B. Lambert, transportation sales manager Westinghouse Electric & Manufacturing Company, New York, N. Y.

"Men and Machinery," by W. E. Wood, president Virginia Electric & Power Company, Richmond, Va.

Informal Round Table Luncheon Conferences

AMBASSADOR HOTEL, 1 P.M.

No. 1-"Fares," G. H. Clifford, sponsor.

No. 2—"Industrial Relations," Edward Dana, sponsor.

No. 3—"Interurbans," Charles H. Jones, sponsor.

No. 4-"New Cars," T. Fitzgerald, sponsor. - "Public Relations," Lucius S. Storrs, sponsor.

Inspection of Exhibits 2:30 p.m.

This afternoon has been set aside by the officers of the association for the inspection of manufacturers' exhibits. The official business of the afternoon is the inspection of exhibits, and every delegate is urged to take advantage of the opportunity to visit the manufacturers' booths, where the most modern equipment and latest appliances are on display.

Tuesday, Oct. 1, 10 a.m. Auditorium Ball Room, Second Floor

JAMES P. BARNES, Chairman

General Subject—Traffic Regulations

Report—Committee on Nominations—W. H. Sawyer, chairman, president Stevens & Wood, Inc., New York, N. Y.

Election of officers.

Election of officers.

"Increasing Street Capacity," by Elmer T. Stevens, chairman transportation section Chicago Association of Commerce.

"Basic Regulation Principles," by Col. A. B. Barber, manager transportation and communication department Chamber of Commerce of the United States of America, Washington, D. C.

Address, by E. F. Wickwire, vice-president Ohio Brass Company, Mansfield, Ohio.

Informal Round Table Luncheon Conferences

AMBASSADOR HOTEL, 1 P.M.

No. 6—"Motor Bus, Interurban and Long Distance Operation," B. W. Arnold, sponsor. No. 7—"Traffic," D. L. Fennell, sponsor.

No. 8-"Education and Training," Jesse S. Hyatt, sponsor

No. 9—"Small City's Problem," A. C. Spurr, sponsor.

No. 10—"Taxation," Harold L. Geisse, sponsor.

ADVISORY COUNCIL EVENING

Tuesday, Oct. 1, 8:30 p.m. Auditorium Ball Room, Second Floor

J. N. SHANNAHAN, Chairman

Plans are under way for an interesting program under the auspices of the Advisory Council. Announcement will be made as soon as the details are completed.

Informal dancing—Music by Roger Wolfe

Kahn's orchestra.

Wednesday, Oct. 2, 10 a.m. Inspection of Exhibits

This morning has been set aside by the officers of the association for the inspection of manufacturers' exhibits. There will be no sessions of the American Association this morning. The Round Table Luncheon Conferences listed below and also the affiliated sessions will be held in the afternoon. The official business of the morning is the inspection of exhibits, and every delegate

is urged to take advantage of the oppor-tunity to visit the manufacturers' booths, where the most modern equipment and latest appliances are on display.

Informal Round Table Luncheon Conferences

AMBASSADOR HOTEL, I P.M.

No. 11—"Motor Bus, City Operation," D. E. Blair, sponsor.

No. 12—"Financing," R. P. Stevens, sponsor

No. 13-"Merchandising," G. A. Richard-

No. 15— Alerthandishis, 6. Alerthandishis, son, sponsor.

No. 14—"The Manufacturer's Interest in Public Transportation," Cornell S. Hawley, sponsor.

No. 15—"Motor Bus Maintenance Methods," Adrian Hughes, Jr., sponsor.

Thursday, Oct. 3, 10 a.m.

Auditorium Ball Room, Second Floor

JAMES P. BARNES, Chairman

General Subject—Progress

Award—Electric Traction Speed Contest —T. Fitzgerald, chairman, vice-president Pittsburgh Railways, Pittsburgh, Pa.

Routine.

"Benefits of Unified Transportation Sys-ms," by Thomas N. McCarter, president ublic Service Co-ordinated Transport, tems," by Thom Public Service Newark, N. J.

"Outlook for Interurbans," by Dr. Thomas Conway, Jr., president Cincinnati, Ham ton & Dayton Railway, Philadelphia, Pa. Installation of officers.

Informal Round Table Luncheon Conferences

AMBASSADOR HOTEL, I P.M.

No. 16—"Publicity and Advertising, E. B. Atchley, sponsor., No. 17—"Freight," Julian M. Bamberger,

sponsor

No. 18—"Safety," R. N. Graham, sponsor. No. 19—"Management," D. W. Pontius,

No. 20—"Motor Bus Design," C. W. Stocks,

Accountants' Association

Tuesday, Oct. 1, 2:30 p.m.

Address of President.

Report of Executive Committee.

Report of Secretary-Treasurer.

Report—Representative of the Accountants' Association at the Annual Convention of the National Association of Railroad and Utilities Commissioners—W. L. Davis, auditor Lehigh Valley Transit Company, Alientown, Pa.

Discussion.

Report—Committee on Standard Classification of Accounts—M. W. Glover, chairman, general auditor West Penn Rallways, Pittshurgh, Pa.

Discussion

Report—Sub-Committee on Bus Accounting—E. A. Tuson, chairman, general auditor
Public Service Co-ordinated Transport,
Newark, N. J.

Discussion.

"Depreciation," by Thomas Conway, Jr., president Cincinnati, Hamilton & Dayton Railway, Philadelphia, Pa.

Discussion.

Report-Committee on Nominations. Election of Officers.

Wednesday, Oct. 2

RITZ-CARLTON HOTEL, I P.M.

Accountants' informal luncheon, followed round table discussion of accounting problems.

Thursday, Oct. 3, 2:30 p.m.

"The Position and Responsibilities of the Auditor in a Railway Organization," by

G. J. Bunting, vice-president in charge of accounting Illinois Central Railroad, Chicago, Ill.

Discussion.

Report—Committee on Stores Accounting—R. A. Weston, chairman, special accountant the Connecticut Company, New Haven, Conn.

Discussion

Report—Committee on Fare Collection— E. A. Tuson, chairman, general auditor Public Service Co-ordinated Transport, Newark, N. J.

Discussion.

Report-Committee on Resolutions.

Installation of Officers.

Presentation of Past President's Badge. New Business.

Claims Association

Monday, Sept. 30, 1:30 p.m. Informal Claims Luncheon

RITZ-CARLTON HOTEL

Tuesday, Oct. 1, 2:30 p.m.

Reading of Minutes of Previous Meeting. Address of the President.

Report of the Executive Committee. Report of the Secretary-Treasurer.

"Efforts of the Bench and Bar to Correct Ambulance Chasing Evils in New York City," by A. C. Mayo, trial attorney Third Avenue Railway System, New York, N. Y. Formal discussion by:

Bert C. Wood, general claim agent Pennsylvania-Ohio Public Service Corporation, Youngstown, Ohio.

P. W. Klabunde, general claim agent the Milwaukee Electric Railway & Light Com-pany, Milwaukee, Wis.

General Discussion.

"Traumatic Surgery," by a Representative of the American College of Surgeons, Chicago, Ill.

Discussion.

Report—Committee on Safety—Bert C. Wood, chairman, general claim agent Pennsylvania-Ohio Public Service Corporation, Youngstown, Ohio.

Discussion

Wednesday, Oct. 2, 2:30 p.m.

"The Effect of the Massachusetts Compulsory Liability Insurance Acts Upon the Number of Accidents, the Number of Suits and the Size of the Verdicts," by P. G. Carleton, general counsel Eastern Massachusetts Street Railway, Boston, Mass.

Discussion.

"The Extent to Which Compulsory Insurance Has Been Adopted in Connecticut and Its Effect Upon the Number of Accidents, Suits and Verdicts," by Seth W. Baldwin, attorney the Connecticut Company, New Hayton, Copp. attorney the Haven, Conn.

Discussion.

Thursday, Oct. 3, 2:30 p.m.

"What a Claim Agent Can Do for His Company and His Community Through a Public Safety Campaign," by C. E. Redfern, claim agent United Electric Railways, Providence, R. I.

Discussion.

"The Importance to Companies of Claims Men Attending Annual Conventions of the American Electric Rallway Claims Association," by Wallace Muir, general attorney Kentucky Traction & Terminal Company, Lexington, Ky.

Discussion.

Report — Committee on Nominations — Wallace Muir, chairman, general attorney Kentucky Traction & Terminal Company, Lexington, Ky.

Election of Officers.

Installation of Officers.

Presentation of Past President's Badge.

Engineering Association

General Meeting, Tuesday, Oct. 1, 10 a.m.

FRANK H. MILLER, Chairman

Address of President,

Report of Executive Committee. Report of Secretary-Treasurer.

Electric Railway Journal Maintenance

Contest Award. Paper by H. H. Adams, superintendent shops and equipment Chicago Surface Lines, Chicago, 1ll.

The Convention

Reported!

ELECTRIC RAILWAY JOUR-

NAL'S October number will

be devoted to a report of

the Atlantic City Conven-

tion. Published immediately

following the close of the

sessions, it will contain a

complete account of the

proceedings.

Discussion.

Discussion and moving pictures—Use of Cylindricai Wheel Treads in Place of Conical Wheel Treads.

General Meeting Thursday, Oct. 3, 2:30 p.m.

FRANK H. MILLER, Chairman

Report—Committee on Revision of Rules—W. W. Wysor, chairman, chief engineer United Rallways & Electric Company of Baltimore, Baltimore, Md.

Report—Committee on Co-operation with U. S. Department of Commerce—E. P. Goucher, chairman, engineer of way and structures Capital Traction Company, Washington, D. C.

Paper by Edwin W. Ely, chief Simplified Practice Division, Bureau of Standards, Department of Commerce.

Discussion.

Paper by A. E. Harvey, superintendent of construction Kansas City Public Service Company, Kansas City, Mo.

Discussion.

Report—Committee on Nominations—R. H. Dalgleish, chairman, chief engineer Capital Traction Company, Washington, D. C.

Election of Officers. Installation of Officers.

Presentation of Past President's Badge.

New Business.

POWER DIVISION

Tuesday, Oct. 1, 2:30 p.m. Committee Room 3, Second Floor

W. E. BRYAN, Chairman

Report—Standing Committee on Power—W. E. Bryan, chairman, superintendent of power St. Louis Public Service Company, St. Louis, Mo.

Reports of Committees:

o. 1-Manual Review-J. Walter Allen, chairman.

No. 5—Specifications for Overhead Line Material—Dwight L. Smith, chairman.

No. 8—Braking Device for Trolley Wire Reels—J. F. Neild, chairman.

No. 9 — Conduit Specifications — W. J. Quinn, chairman.

General Discussion.

Address—W. W. Wysor, first vice-president American Electric Railway Engineering Association, New York, N. Y.

"Power Requirements of City Cars as Affected by Gear Ratio," by S. B. Cooper, manager railway engineering department Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

"Comparison of Results of Operation and Maintenance Between Properties," by J. F. Neild, electrical engineer Toronto Trans-portation Commission, Toronto, Canada.

Discussion.

Wednesday, Oct. 2, 2:30 p.m. Committee Room 3, Second Floor

W. E. BRYAN, Chairman

Reports of Committees:

No. 6-Trollephy, chairman. 6-Trolley Wire Wear-H. S. Mur-

No. 2-Power Rectifiers-H. W. Codding,

No. 13—Proper Trolley Voltage for Congested City Districts—A. J. Kiatte, chair-

General Discussion.

"Effect of Trolley Voltage on Schedule Speed," by speaker to be announced later.

Informal Presentation of progress reports of other Power Division committees. General Discussion.

PURCHASES AND STORES DIVISION

Tuesday, Oct. 1, 2:30 p.m.

A. A. ORDWAY, Chairman

Report — Standing Committee on Purchases and Stores—A. A. Ordway, chairman. general storekeeper Boston Elevated Railway, Boston, Mass.

Discussion.

Address—W. W. Wysor, first vice-president American Electric Railway Engineering Association, New York, N. Y.

"Engineering Aspects of Purchasing," by R. C. Cram, assistant engineer Third Ave-nue Railway System, New York, N. Y. Discussion.

Wednesday, Oct. 2 Informal Luncheon Meeting

RITZ-CARLTON HOTEL, 1 P.M.

Wednesday, Oct. 2, 2:30 p.m. Committee Room 4, Second Floor

A. A. ORDWAY, Chairman

"Advantages of the Simplified Practice Movement," by Edwin W. Ely, chief Simplified Practice Division, Bureau of Standards, Department of Commerce, Washington, D. C.

Discussion led by George A. Cooper.

Reports of Committees:

No. 1-Manuai Review-J. Fleming, chairman.

No. 2—Unit Piling and Standard Packages—W. E. Scott, chairman.

No. 3—Investment in Material and Supplies and the Cost of Operating Stores—W. S. Stackpole, chairman.

No. 4—Methods and Practices for Keeping Price Records and Pricing Materials and Supplies—A. A. Ordway, chairman.

No. 5—Simplification and Standardization of Stock Including the Disposition of Surplus and Obsolete Material—W. L. Wuster, chairman.

No. 6—Control of Materiais and Supplies Including Control of So-called Floating or Line Stocks—E. F. Kelley, chairman.

No. 7—Reclamation of Used Material and Sale of Scrap and Salvage—W. H. Staub, chairman.

General Discussion.

ROLLING STOCK DIVISION

Tuesday, Oct. 1, 2:30 p.m. Committee Room 2, Second Floor

A. T. CLARK, Chairman

Report—Standing Committee on Rolling Stock—A. T. Clark, chairman, superintendent rolling stock and shops United Railways & Electric Company of Baltimore, Baltimore, Md.

General Discussion.

Reports of Committees:

No. 1-Manual Review-W. C. Boit, chair-

No. 2-Motor Coaches - P. V. C. See, chairman.

Address—W. W. Wysor, first vice-president American Electric Railway Engineering Association, New York, N. Y. Reports—Special Committees:

No. 3-Car Design-H. H. Adams, chair-

No. 4—Lighting—R. W. Cost, chairman. No. 5 — Roller Bearings — W. C. Boit,

chairman.

No. 6-Lubrication-J. H. Lucas, chair-

No. 7—Automatic Coupler Specifications
—P. V. C. See, chairman.
No. 8—Fire Hazards in Shop Practices—
E. J. Jonas, chairman.

No. 9—Noise Reduction—H. S. Williams, chairman.

No. 10—Welding Wheel Flanges—J. S. McWhirter, chairman.

No. 11—Current Collecting Devices—Hugh Savage, chairman.

No. 13-Limits of Wear-W. T. Vivian, chairman.

General Discussion.

Report—Committee on Heavy Electric Traction—H. F. Brown, chairman, assistant electrical engineer New York, New Haven & Hartford Railroad, New Haven, Conn.

General Discussion.

Wednesday, Oct. 2, 2:30 p.m. Committee Room 2, Second Floor

A. T. CLARK, Chairman

"Seeking Ideal Car Performance," by W. A. Keller, supervisor of method, technical division Pittsburgh Railways, Pittsburgh burgh, Pa.

Discussion.

WAY AND STRUCTURES DIVISION

Tuesday, Oct. 1, 2:30 p.m. Committee Room 1, Second Floor

E. M. T. RYDER, Chairman

Introductory Remarks — W. W. Wysor, first vice-president American Electric Railway Engineering Association, New York, N. Y.

Report—Standing Committee on Way and Structures—E. M. T. Ryder, chairman, way engineer Third Avenue Railway system, New York, N. Y.

Committee Reports:

No. 1—Manual Review—W. R. Dunham, Jr., chairman.

No. 2 — Special Trackwork—E. M. T. Ryder, chairman.

No. 5-Wood Preservation-C. A. Smith, chairman.

No. 6-Arc Welding-C. F. Gailor, chair-

No. 8-Pavement-A. E. Harvey, chairman.

No. 11—Track -Track Construction-C. L. Haw-

No. 13.—Joint Railway and Bus Terminals -E. D. Eckroad, chairman.

General Discussion.

Report—Committee on Welded Rail Joints—E. M. T. Ryder, vice-chairman, way engineer Third Avenue Railway System, New York, N. Y.
Discussion.

Wednesday, Oct. 2, 2:30 p.m. Committee Room 1, Second Floor

E. M. T. RYDER, Chairman

· Reports of Committees.

No. 7—Alloy Steels Other Than Manganese for Special Trackwork—A. T. Spencer, chairman.

No. 9-Motor Bus Garage Design-Morse W. Rew, chairman.

No. 12-Rail Corrugation-W. W. Wysor, chairman.

No. 14-Light Section Rail-C. A. Aiden, chairman. No. 15-Track Gage-C. H. Clark, chair-

No. 16—Study of Foundation and Supporting Structures for Steam Railroad Crossings—H. F. Merker, chairman.

General Discussion.

Transportation and Traffic Association

Tuesday, Oct. 1, 2:30 p.m.

Address of the President.

Report of the Executive Committee.

Report of the Secretary-Treasurer.

Report—Committee on Resolutions—Paul E. Wilson, chairman.

Report-Committee on Nominations.

Election of Officers.

Report—Committee on Movement of the Vehicle—D. L. Fennell, chairman.

Address, by Labert St. Clair, director of advertising, American Electric Railway Association.

Report—Committee on "The Small City" -A. C. Spurr, chairman.

Discussion.

Wednesday, Oct. 2, 2:30 p.m.

Address—"Competition and Rate Making," by Philip Cabot, professor of public utility management Harvard University School of Business Administration, Boston, Mass.

Report—Committee on "Equipment"—Adrian Hughes, chairman.

Discussion.

Thursday, Oct. 3, 2:30 p.m.

Report—Committee on "The Passenger"—W. W. Holden, chairman.

Discussion.

Address—"Public Transportation from a Woman's Viewpoint," by Miss Mary A. Brennan, Pittsburgh, Pa.

Report—Committee on "The Employee" -Ralph W. Emerson, chairman.

Discussion.

"Trainmen's Conference"—Demonstr by employees of Pittsburgh Railways.

Canadian Meetings at **Atlantic City**

Two meetings of the Canadian Electric Railway Association will be held at Atlantic City during the period of the A.E.R.A. Convention. The first, a general gettogether meeting, is scheduled for 10:30 a.m. on Wednesday, Oct. 2. The second, which will be an executive meeting, will be held at 3 p.m. on the same day. Both meetings will be held at the Auditorium in the Ball Room Smoking Room. Two meetings of the Canadian Electric

News of the Industry

Sliding Scale Fare Expected in St. Louis

The Public Service Commission is expected to issue a formal order permitting the St. Louis Public Service Company, St. Louis, Mo., to put into effect the new sliding scale fare plan suggested by City Counselor Muench at a public hearing held by

the commission on Aug. 20.

Under the Muench plan the company will sell 12-ride books for 90 cents good for use in any one week. If a bookholder rides more than twelve times in the week he is to pay 5 cents for each additional ride. The single fare for adults will be 10 cents. The fare for children between the age of five and twelve years remains 3 cents. The universal transfer system now in effect on all of the cars and bus lines in St. Louis will be continued.

At the outset of the hearing Mr. Muench submitted a formal statement explaining the city administration's views. He said

in part:
"Some means must be found to retain the railway. The problem of service at a reasonable cost that at the same time gives the operators a fair return on the value of their property, is one which has confronted every community in this country during the past ten or fifteen years. It still confronts most of them.

"To some extent increased expenditures and loss of patrons have had to be compensated for through an increase in rates; however, means should be found to retain a large number of the car riders, and to bring back those who are patronizing competitive means of conveyance, by innovations or improvements in the service and by fare concessions."

COMPANY PREPARED TO TRY PLAN

The statement then reviewed how competition had eaten into the patronage of the company with nothing done in the way of a fare concession except the 25-cent Sunday pass.

It pointed out that shortly after the company applied for a flat 10-cent fare and four rides for 35 cents, and the commission suspended this schedule for 120 days from Aug. 1, the matter of making a concession in rates to the regular consumer came up for consideration. At the request of the commission several conferences were held and finally the company proposed a flat 10-cent fare for casual riders and 16-ride book for \$1 and extra rides in any one week at 5 cents. He said:

"The reaction to this proposal on the part of the public and the press was that the regular car riders would be obliged to buy more rides than they would normally use in a week in order to obtain a reduction in the fare."

His proposal of 12 rides for 90 cents was

made to meet this objection.

Stanley Clarke, president, said that the company is willing to try the Muench plan "although we are convinced that we have not more than a fifty-fifty chance that it will prove successful."

Pending the promulgation of the new schedule, the company has restricted the sale of tokens on its cars and buses. The company desires to have a minimum number of tokens in the hands of the public when the 10-cent fare for casual riders goes into

Interstate Line Expands Its Freight Facilities

A permit for the erection of a new freight house at 443 South First Street, Louisville, Ky., to cost \$30,000 has been issued by the city building inspector's office to

the Louisville & Southern Indiana Traction Company, subsidiary of the Interstate Publice Service Corporation. The building is to be part of the company's new freight terminal at that point.

The company operates the interurban service between Louisville and Indianapolis. For several months it has been cut off from direct connection over its own rails into Louisville due to reconstruction work by the Big Four Railroad on its bridge, ove: which the interurban operated. Meanwhile passengers have been brought across from Southern Indiana by bus.

"Deadlock Committee" in Chicago

Every effort being made to reach settlement so new grant can go before voters in fall

THE appointment of a "deadlock committee" has offered what promises to be a satisfactory solution of an acute situation in Chicago's long drawn out struggle This comfor a new railway ordinance. mittee was appointed on Aug. 16 by Col. A. A. Sprague, acting chairman of the citizens' committee, whose help was solicited when the Council sub-committee reached a deadlock in its efforts to write an ordinance in which the rate of return is the principal bone of contention between the city and the transit companies.

As matters stood early in the week commencing Aug. 19, unless an agreement was reached during the week it will be impracticable to submit the franchises to a referendum at the judicial election in November. In that case a referendum will have to go over until the next Mayoralty election, unless a special election be held not later than Feb. 1.

Prof. Charles M. Thompson, dean of the college of commerce at the University of Chicago, is chairman of the new committee. Other members are David A. Crawford, president of the Pullman company; John A. Carroll, head of several south side banks; Victor A. Olander, prominent labor leader, and John Stuart, president of the Quaker Oats Company. The last named takes the place of George A. Ranney, vice-president of the International Harvester Company, who was originally named, but was unable to accept. Both Dean Thompson and Mr. Carroll are members of the citizens' traction settlement committee.

Negotiations came to a deadlock Aug. 13. Colonel Sprague pointed out the chief reasons for the lack of progress as: the construction of subways, the rate of return to the company, and its financial structure. Since the engineers have as yet made no report, no difference of opinion is involved over the subway matter. The other two points he defined as "purely financial problems" to be weighed and tested by men versed in financial matters. As the result of Colonel Sprague's suggestions, the committee was appointed and held preliminary session on Aug. 19. On Aug. 20, the new committee, together

with the present transit sub-committee of the City Council, opened public hearings. After collecting expert data and information on financial structure, rates of return and the ratio between stocks and bonds, the committee will express its views, acting in an advisory capacity to the City Council, which is charged with the duty of writing the ordinance, subject to review by the

As stated before, the real bone of contention is the rate of return. The companies' attitude, set forth in a written statement at the beginning of negotiations, asks a "just and reasonable return" money invested in the property, that re-turn to be determined by the local transit commission which would be appointed by the Mayor, with the approval of the City Council. The city, represented by Walter Fisher, stands for an agreed rate of return on the present investment, which is

COMING MEETINGS

Aug. 27—National Association of Railroad and Utilities Commissions Aug. 27—National Association of Railroad and Utilities Commission-ers, Glacier National Park, Mont. Aug. 30—Maryland Utilities Asso-ciation, Plimhimmon Hotel, Ocean

ciation, City, Md.

Sept. 10-11—Central Electric Railway Master Mechanics' Association, Fort Shelby Hôtel, Detroit, Mich.

Sept. 28 - Oct. 4 — American Electric Railway Association, 48th annual convention and exhibit, Atlantic City Auditorium.

Sept. 30-Oct. 4— National Safety Congress, Chicago, Ill.
Oct. 23-24—Public Utilities Association of West Virginia, Wheeling, W. Va.

Nov. 6-7-Association of Electric Raiiway Equipment Men, Middle Atlantic States, Richmond, Va.

Nov. 7-8—Iowa Electric Railway Association, Operators Section, an-nual convention, President Hotel, Waterloo, Iowa.

Nov. 21-22—Public Utilities Association of Virginia, annual meeting, Chamberlain-Vanderbilt Hotel, Old

Chambertain-Vanderblit Hotel, Old Point Comfort, Va.

Jan. 23-24, 1930—Central Electric Railway Association, Statler Hotel, Cieveland, Ohio.

Jan. 27-29—Electric Railway Association of Equipment Men, Southern Properties, Birmingham, Ala.

about \$260,000,000. On new money put into transportation, the Fisher plan provides that only its actual cost be paid, plus a reward for economy and efficiency in service. Alderman E. L. Frankhauser, chairman of the Council sub-committee, supports this

When Mr. Fisher asked information concerning the financial structure of the new corporation, the lawyers for the companies replied that details had not yet been worked out. Mr. Fisher desires that the new financing be by issuance of bonds. Company attorneys say that the Fisher plan is a new and untried scheme, that no utility company in the country is now operating under such a system, and that under the Fisher plan it will be difficult, if not impossible, to finance the many extensions needed. For the first ten years it has been estimated that \$135,000,000 will be spent for extensions, and another \$100,000,000 for the following ten years.

For three weeks the city and company

representatives have debated only "basic principles" and "fundamentals."

One-Man Car Proposal Rejected by Des Moines Men

The union, by an almost unanimous vote at a special meeting, has rejected a proposal made by Walter J. Cummings, president of the Des Moines Railway, Des Moines, Ia., which would have given the city one-man operation and would have provided a maximum hourly increase of 8 cents for the trainmen.

The present maximum wage for trainmen is 59 cents an hour. The proposed agreement was for a flat increase of 5 cents an hour, with 1 cent additional each year

for three years.

The position of the union is that the 25-year agreement signed with the Des Moines City Railway in 1915 is binding upon the new owners of the property in spite of the fact that under the terms of the receivership sale, held on June 22, the Federal District Court approved the transfer of the property to Mr. Cummings and associates without the famous two-man car

Apparently the one-man car clause in Mr. Cummings' proposal was the only objectionable feature, as the men expressed themselves in favor of the pension and life insurance provisions, as well as the check-off and several other clauses relating to

working conditions.

The company agreed to set aside \$18,000 annually for retirement and disability pensions. Any member of the union who had served twenty years or more and had reached the age of 65 years was to be eligible for a monthly pension of \$58. The same payment was to be made in a case of total disability in the company's service. The proposed agreement provided that in case of death of any member of the union his beneficiary was to receive \$1,000 life insurance, to be provided by the company.

The negotiations between union leaders and railway officials have been carried on with good will on both sides. J. Ben Wiley, veteran secretary of the union, in addressing the 600 members of the union, complimented Mr. Cummings and General Manager Gifford on their "square deal-ings" and credited them with "laying their cards on the table."

Conferences have continued since the rejection of Mr. Cummings' proposal, but were declared off for the time being on Aug. 21.

Eighth Week of New Orleans Strike

Company Maintains Its Position and Increases Service on All Lines. Council Battles Jitneys

NO PROGRESS has been made toward a solution of the deadlock at New Orleans. The most recent offer of the union to accept John A. Ryan, Washington; Rabbi Stephen Wise, New York; or Secretary of Labor Davis, as an arbitrator was refused by the New Orleans Public Service, Inc., which declared that the company itself must be the only judge of whether its property shall be operated

on an open or closed shop basis.

Failure of this offer to receive more favorable consideration has dampened much of the still current hope that an amicable settlement of the strike could be reached. As a result, persons in touch with the situation were of the opinion that the final outcome will depend largely on the result of the present jitney fight. If the city is sustained in its warfare against the jitneys, it will mean the elimination of this mode of transportation in the face of the costly indemnity bonds. If this happens, it was pointed out that the lot of the striking carmen, many of whom have already been replaced by permanent employees, will be altogether hopeless.

With the strike entering its eighth week, interest is centered in the outcome of a court battle instituted by jitney drivers in an effort to prevent police from interfering with the operation of the 10-cent automo-The jitney war came as an aftermath to last week's riotous scenes at the city hall when a mob of 1,000 striking car men and union sympathizers attacked acting Mayor Walmsley and members of the Commission Council in the Council Chamber. A police captain shot and slightly wounded three men before the mob was controlled and the hall cleared of fighting men. Next day the Council ordered the law enforced to compel jitney drivers to obtain \$5,000 indemnity bonds, and otherwise to conform to the city and state traffic regulations.

Police arrested hundreds of jitney drivers, the majority of whom later obtained their release in the Recorder's Court when the city was unable to offer conclusive proof that the jitney drivers were charging or accepting fares from passengers.

The police activity, however, resulted in the elimination of a considerable number of the jitneys and in a corresponding increase in the number of street car riders.

In their perplexity the jitney drivers filed suit in the civil court for an injunction to restrain the police from interfering with the operation of the jitneys. The city lost the first round in this battle when the court overruled a motion to dismiss the suit and ordered it tried on its merits. The case was being heard by the court on Aug. 22, but a decision will probably not be reached before the end of the week.

While attorneys for the city and the jitney drivers are exchanging verbal blows, the merry game of hide-and-seek between police and the jitney drivers continues, with the traveling public still making limited use of the jitneys and of private conveyances in going to and from their work. Many cars continue to operate empty in off peak hours, but during the peak most of them carry capacity loads.

Fast Work at Mount Tom

waiting temporary restaurant and observatory on the summit of Mount Tom, recently erected by the Holyoke Street Railway following the loss of the large Summit House by fire, is 40×60 ft. in dimensions and the height, from the first floor to the 8,000,000-cp. beacon light on the tower, is 65 ft. The first floor contains the restaurant and the second floor is used as an observatory. From the tower a searchlight is thrown on the Barnes Air-port, between Holyoke and Westfield. In the event of the erection of a larger building, the present structure will be turned into a pavilion on Little Mountain or some other part of the Mount Tom property.

Erection of the new building is re-

Telling Bostonians What Goes On in Their Own City



The front page of the fifth edition, just out, of the Boston Elevated Railway guide book is a cartoon - style presentation Boston with some of the principal features and their approximate location. This design, printed in several colors, was drawn by William Duncan of the Massachusetts Art School, the stuchusetts dents of which were invited to enter a competi-tion for designs for the cover.



Fast work was done on temporary structure on Mount Tom

garded as notable for speed, considering the conditions encountered. All the material was transported up the mountain in the two cars ordinarily used for passengers. Steel was fabriused for passengers. Steel was fabricated in dimensions to permit of this handling and special fastenings were used to bind the metal to the cars. The steel was delivered by the Palmer Steel Company, Springfield, at the carhouse in Holyoke and conveyed by the railway to the site, where it was erected by the Casper Ranger Construction Company, Holyoke. The outer walls are faced with corrugated sheet metal, covered with asbestos. George E. Pellissier, chief engineer of the railway, designed the structure.

The fire occurred on May 2, the vote to erect the new building on May 11, plans were in preparation May 13, construction started on May 16 and work was completed on June 1. The building was officially opened on July 1. It was necessary to build a new water tank and connections.

There are 28 spotlights on the building and long parallel strings of light from the building to the upper station, 500 ft. distant, to light up the premises as

viewed from a distance.

The dining room contained in the old building is much missed as a place for large meetings, but the receipts at the new building for July were about the same as at the old house in July, 1928.

Many Topics Discussed

Competition afforded by gasoline driven vehicles hour, holds place of interest at meeting of Wisconsin Utilities Association

AUTOMOBILE competition was discussed in practically all the papers and reports presented at the seventh annual convention of the Transportation Secconvention of the Transportation Section, Wisconsin Utilities Association, held Aug. 15 and 16 at Green Bay. In his opening address Chairman Henry Cordell, Chicago, North Shore & Milwaukee Railroad, urged that street traffic be regulated with more sympathetic regard for public transportation patrons, rather than to conform to the wishes of the individual motorist. Cars must be made more inviting architecturally and must be more harmoniously furnished, said A. F. Tegen of the Milwaukee Electric Railway & Light Company, in developing the argument that the industry problem today is to furnish rail equipment that will surpass the comfort and convenience of the automobile.

Ways and means of attacking the parking problem were described by J. B. O'Connell, Chicago Surface Lines. For their own interest and for the good of the community, railway properties should take the initiative in analyzing the use of the streets. Parking restrictions should be tightened gradually, Mr. O'Connell said. meanwhile showing business men that the process is an asset, rather than a liability

The very success and popularity of the automobile is proving its undoing, according to C. Edward Thorney, Chicago, North Shore & Milwaukee Railroad, who outlined the advertising campaign being con-ducted by the North Shore and associated companies. Newspapers, car cards and billhoards are directing the attention of the public to the number of automobiles on the roads and their badly congested condition, and the convenience of high-speed electrified transportation. Free parking at terminals is intended to encourage the use of automobiles between stations and points not served by electric railway lines. In every conceivable manner of publicity, the campaign is hammering home the sloran "The Steel Highways Are Always Open," together with "Go the Carefree Way.

The second day's session was opened with an address by President G. W. Van Derzee of the Wisconsin Utilities Association. After referring to the unwarranted abuse and unscrupulous attack directed against the utility industry as a whole

during the past year, Mr. Van Derzee emplasized the importance of employee education. The human element, he said, is the most important in the long run. contacts between the men and women who are responsible for the service and those who use it are not up to or better than the standards of public contact which one expects to receive in successful merchandising organizations of today, our job of service is not well done."

MANY POINTERS ON CAR CLEANING

Considerable discussion followed the presentation of a report on car cleaning, by John H. Kuony of the Milwaukee Electric Railway & Light Company. The report The report was concluded with a set of instructions for performing the various cleaning operations. It costs on the average \$100 a year to keep each car clean. The problem is of doing the best possible job at the least expense. A cleaning agent other than water must be used at frequent intervals, the report held. A carefully planned method must be followed on a regular time or mileage schedule. Mr. Kuony told of a promising scheme being tried out in Milwaukee. This consists of the application of wax to newly finished jobs or on any cars with a good finish. More time is required at first than for normal cleaning, dured at first than for normal cleaning, but afterward the car can be cleaned merely by wiping off the waxed surfaces with a dry cloth. Waxing every six months is sufficient, he said, to maintain the necessary protective film.

A rotary brush type of washer, used ith gratifying success by the North with gratifying success by the North Shore system, was described by Kenneth M. Wilkins of that company. The cars are driven through, under their own power, in three minutes, when both sides are cleaned with a solution and rinsed with water at 300 lb. pressure. An additional five minutes is required for hand washing of the two vestibules. With one man at the hose and one motorman, the machine handles fifty units a day, Mr. Wilkins said, at a total cost of 47.5 cents each. The quality of the cleaning is uniform, whereas with the manual method it falls off at the end of the day when the cleaners become fatigued. The cost is 63 cents a car for hand work where long-handled brushes are

used.

An outstanding feature of the convention was the report of the committee on standard maintenance practice. This took the form of a maintenance guide, submitted as an 84-page printed pamphlet containing complete and yet simple instructions for the foremen and employees actually doing the The guide can be secured by properties outside the association at a price of \$1 a copy, to cover the cost of printing. This guide was merely a start, to be adapted to local conditions, and was not intended to destroy initiative. It was compiled primarily by the supply members of the committee, but their suggestions were reviewed and approved by the operating

A paper on safety—the essential in transportation—was presented by A. A. Oldfield. This urged adequate tion of the safety expert. He should be permitted to function without undue interpermitted to function without undue interference and should have the whole-hearted co-operation of other departments.

A. L. Thomas described the conference work being done by the Chicago, North Shore & Milwaukee Railroad to improve relations between the platform men and the passengers. This was carried on by the conference method. In 2½ years complaints from the public had been cut down plaints from the public had been cut down from an average of ten to two a week.

Two-Cent Fare Advance in Miami

The City Commission of Miami, Fla., on July 29 signed a one-year agreement with the Miami Beach Railway for the collection and payment to the city of the additional 2-cent fare which went into effect on Aug. 1. The new agreement includes a clause protecting the railway from operating deficits should the number of passengers riding the cars decrease.

The commission also has agreed that the railway shall receive a fee of not more than 5 per cent for collecting the additional 2 cents, and that the company shall make an accounting to the city on the tenth of each month and pay the money by the fifteenth of each month for the collections made during the preceding month. Fares colin corresponding months of 1927 lected and 1928 will be used as the basis for computing the payment to be made to the company by the city in the event of operating deficits.

Another provision of the agreement states that the company shall collect a 5-cent fare from pupils attending school "up to the age of eighteen years between the hours of 7 a.m. and 5 p.m. on school days. Provision is further made that school pupils must purchase school tickets from the company in order to obtain the 5-cent fare.

Receipts of the 2-cent increase will be placed in a municipal sinking fund for retiring a \$1,018,000 bond issue, the money of which was used for the purchase of

railway equipment.

Some time ago, Commissioner Reeder made it plain that the interest charges and the sinking fund payment, called for under the terms of a bond issue made by the city to provide funds under which the railway was extended at the city's behest and with city funds, had become a dead weight on the tax payers. Apparently the hope is to ease this burden on the city through an advance in fare.

New Working Agreement Arranged in Providence

Members of the Amalgamated Association at Providence, R. I., have voted to accept the new contract between the union and the United Electric Railways which has been the subject of negotiations between officials of both organizations since

Tune 1.

The executive board of the union recommended five demands, regarded as of minor importance, relating to working conditions on cars and buses and two questions per-taining to power house employees. The members concurred in the opinion that these seven points be laid before the railway officials by the union's agreement committee. The five demands pertain to the work of spare men on cars and buses, and the points relating to the power house employees stipulate that the last man hired be the first man laid off, and that the company use no discrimination against union men in the matter of vacations and the six-day week.

The principal changes in the agreement include an increase in wages for all employees ranging from 1 cent an hour for motormen, conductors and bus drivers to 7½ cents in the bridge building department, a readjustment and shortening of hours, a guarantee of seven hours' work in not more than two shifts daily for spare motormen and conductors, and the elimination of the requirement that men transferred from

cars to buses shall have had a driver's license for at least two years.

The contract is for two years and is retroactive to June 1. Under its terms employees will receive back pay ranging from \$5.60 to about \$21, with a few of the men drawing sums in excess of the latter

figure.

The contract adopted in 1927 expired at midnight on May 31 of this year. Since that time the men have continued to work under the terms of the old contract with the expectation that any changes in wage scales embodied in the new agreement, would be retroactive.

. Change in Gary Fares Sought

The Gary Railways, Gary, Ind., has asked authority to readjust its fare structure in the city. It would establish a cash fare of 10 cents, a rate of twelve tokens for \$1, and a weekly "nickel" ticket for for \$1, and a weekly regular patrons to be sold for 40 cents and entitling the holder to ride as often as desired during the week for a 5-cent cash fare. The company would issue free transfers to connecting car and bus routes. School childrens' tickets would remain at six for 25 cents.

The proposed schedule of fares calls for the elimination of the three fare zones in Gary, Hammond and East Chicago, thus doing away with the present double fares in these cities. Such a step would reduce the fare between Gary and Hammond, for instance, from 24 cents, or three 8-cent fares, to 20 cents, or two 10-cent cash fares. and would permit Gary passengers to ride anywhere within the city limits for a single

Under the rate structure now in effect, riders in Gary pay a cash fare of 8 cents. Tokens are sold at fourteen for \$1 and a charge of 2 cents is made for transfers between cars and buses. No change in present cash or commutation rates on the Hobart, Crown Point and Valparaiso divisions is proposed by the company.

According to the petition, net earnings show a return of only 4 per cent on the present value of the company's properties. Present net earnings, it is declared, are insufficient to attract the additional capital needed for improvements and extensions demanded by the riding public.

"Stolen from the T.C.C."

Officials of the Toronto Transportation Commission, operating the municipal railway and bus lines in Toronto, Ont., have had "Stolen from the T.T.C." frosted on the glass of every electric light bulb used in the 38,000 or more sockets from which electric energy is drawn in an ordinary day's operation of the system. "Stolen from the has also been burned deep in the wooden legs of the camp stools used during periods of emergent traffic conditions on the Grey Cach Lines, Ltd. According to Eustice Smith, secretary, the commission was losing quite a few bulbs. They were even being removed from the street cars. Since the personal little statement has been affixed on every electric light bulb the losses have become practically negligible. Smith is reported to have said:

"We figured that if the average person has to sit at home night after night on a stool marked 'Stolen from the T.T.C.' and see 'Stolen from the T.T.C.' on his electric light bulbs he is going to feel rather guilty sooner or later. At night the lettering looms up like a barn in a fog when one of

the bulbs is turned on.

Labor Federation on New Orleans Strike

The executive council of the American Federation of Labor, in a public statement issued on Aug. 20 at Atlantic City, N. J., at the closing session of its quarterly meeting, declared the federation "will co-operate in every possible way" with the Amalgamated Association in carrying the New Orleans strike to a successful conclusion. The executive council directed the officers of the federation to investigate the policies of public service corporations in general, to determine their attitude toward labor, and, in consequence, the attitude of the federation toward them. A statement issued by William Green, president of the federation, said in part:

'The executive council is deeply interested in the strike situation in New Orleans. It expresses the hope that the strikers will continue the strike until a satisfactory settlement is reached. It calls upon all the people of New Orleans to assist the striking street car men in every reasonable and honorable way. The executive council will co-operate with the Amalgamated Asso-ciation in every possible way in carrying. on the strike to a successful termination.

In view of the attitude of the utility at New Orleans toward labor the executive council directs the officers of the American Federation of Labor to conduct an investigation of the policies of public service corporations, including holding companies, in order to determine their general attitude toward labor and the settlement of labor disputes. The future attitude of the American Federation of Labor toward public service corporations and holding companies will be determined in the light of such facts as said investigation may disclose.'

Union Charges St. Louis Award Terms Are Not Met

Members of the Amalgamated Association employed by the St. Louis Public Service Company, St. Louis, Mo., in a letter to Mayor Miller on Aug. 15 charged that the company has failed to live up to certain provisions of an arbitration award made by the Missouri Public Service Commission on May 20 last. The union says the company failed to grant a 4-cent an hour increase provided for shop men. It also charges that the company failed to comply with the state commission's stipulation that the tripper runs should not exceed 10 per cent of the regular runs.

Road Builders to Study Traffic

M. O. Eldridge, assistant traffic director, Washington, D. C., as chairman of the committee on traffic of the American Road Builders' Association, has named sub-committees to study every phase of the traffic problem. The findings will be presented at the association convention and road show in Atlantic City next January. The collection of accident statistics and analysis of accidents will be in charge of a group headed by Burton W. Marsh, Pittsburgh, Pa., which will also study traffic flow maps and spot maps, the necessity for uniformity in state and city vehicle laws and the question of why and where parking should be restricted or eliminated entirely. All questions dealing with regional planning will be in charge of the group headed by Dr. J. Gordon Mc-Kay, Cleveland, Ohio.

Franchise Discussion Reviewed at Columbus

At the invitation of Benjamin W. Marr, president of the Columbus Railway, Power & Light Company, Columbus, Ohio, Harry Allensworth, accountant and consulting en-gineer, has been inspecting the books of the company on behalf of the Council. Mr. Allensworth, his task completed, is now Allensworth, his task completed, is now assembling the figures so they can be digested by members of the Council. After the Council has a clear picture of the status of the company's finances and volume of business, company officials will confer with the City Council to work out a franchise acceptable to both.

As matters stand at present it appears likely the railway franchise proposition will again come before the Council for discussion during September. The company has been operating without a franchise for several years, due to a lack of agreement between the Council and the company as

to the fare.

When an ordinance is finally passed by the Council it must be placed before the voters for approval.

Briefs Filed in New York "L" Fare Case

In a brief filed on Aug. 16 with the New York Transit Commission the Interborough Rapid Transit Company renewed its plea for an immediate temporary fare "in excess of 5 cents" on its elevated lines, pending final decision on its application of June for a 10-cent fare on that system. brief declared that the commission has jurisdiction and power to alter the elevated fare regardless of the decision of the United States Supreme Court against a 7-cent rate on the combined subway and elevated network.

Dismissal of the application was urged in a joint brief filed by Samuel Untermyer, special counsel for the commission, and Corporation Counsel Hilly. It declared that the commission was without jurisdiction because the fare was contractual by virtue of the elevated extension certificates of 1913, which were executed at the same time as the subway fare contract.

Binghamton's Color Contest Successful

The Triple Cities Traction Company, Binghamton, N. Y., successor to the Binghamton Railway, has been conducting a contest for a monogram for the new company. A prize of \$10 was offered to the winner. The contest closed Aug. 1, but the winner has not yet been selected. One hundred and yet been selected. One numered and sixty-five persons submitted 294 designs. Most of them came from the Triple Cities, Binghamton, Johnson City and Endicott—but New York City and Buffalo were on the list.

The company also asked for suggestions for color for cars and buses with

the following result:

Sixty-six persons made 78 suggestions, 24 of which favored the company's present color, red. Among the comments contained in the replies were the following:

"You cannot find a better color."

"Have never seen better."

"It seems to me the present color is as good as any."

"I think the present color is much

more attractive than dingy green and

yellow seen in other cities."

"The present color scheme of your cars and buses is in every way most desirable."

The present color, therefore, will be used for the body of the car, but the

color of the upper part may be changed. Other suggestions were: Dark green, 8; light green, 11; orange, 9; yellow, 7; blue, 11, still others suggested chocolate brown and cream, olive green with cream trim, royal purple with white trim, canary yellow with dark trim, apple green with lemon yellow trim, dust gray with burnt orange trim,

Special School Fare Arranged in Duluth

A 5-cent fare for school children has been agreed upon by the Duluth Street Railway, Duluth, Minn., and city officials. The regular rate in Duluth is 10 cents cash and six tokens for 45 cents. Starting Sept. 3 school children will be able to buy ten tokens for 50 cents good between the hours of 7:30 a.m. and 5 p.m. The new plan is an outgrowth of a recent increase in fare The city appealed, and a for Duluth. citizens' committee was appointed to study the question. The result was the suggestion that the appeal be abandoned if the company would agree to a special rate for

The Radial Railway Issue at Toronto

Reeve Fred Lundy, a member of the county traffic committee, authorized by the York County Council to inquire into the proposed action of the Toronto Transportation Commission of discontinuing the Meteoplism Redial corries on Sept. 30 Metropolitan Radial service on Sept. 30, says that, according to the evidence already at hand, the county would be able to pre-sent a strong case to the Toronto City Council when the committee appears before that body next September and registers opposition to the proposal of the Toronto Transportation Commission to substitute service by bus for that now furnished by the radial railway. The county is said to feel that the deficits said to exist in the operation of the radial line have been overestimated, and to be convinced that a definite contract "forbids the closing of the service without the consent of the county." Colonel Lennox, counsel for the county, has intimated that the county will seek an injunction to prevent the stopping of the service on Sept. 30, if a satisfactory agreement had not been reached by that time.

Late News Briefs

Philadelphia, Pa.-The Public Service Commission has agreed that the hearing on the Universal Cab Company's application for a certificate of convenience should be adjourned until the Philadelphia Rapid Transit Company has had an opportunity to prepare its case in opposition.

Detroit, Mich.—Del A. Smith, general manager of the Municipal Street Rail-way, and Police Inspector Edward A. Mitte, director of traffic, have informed the Council that removal of the Soldier's and Sailor's Monument would expedite traffic on Cadillac Square.

Los Angeles, Cal. — The Board of Public Utilities and Transportation has approved the application of the Los Angeles Railway for a 21-year franchise to double track Grand Avenue for its electric line, from Jefferson Street to Santa Barbara Avenue, a distance of about 1 mile, instead of operating over its private right-of-way east of Grand Avenue, as at present.

St. Louis, Mo.—Sam W. Greenland, vice-president and general manager of the St. Louis Public Service Company, has sailed from New York for Europe to join Mrs. Greenland, who is ill in The Hague. Mrs. Greenland was touring Europe with the Advertising Club delegation to the international convention of that organization held in Berlin recently.

Baltimore, Md.—To provide faster and more convenient car service from the Guilford and Homeland sections of Baltimore to the downtown area, the United Railways & Electric Company has con-solidated the Gilmor Street and Guilford solidated the Gilmor Street and Guiltord Avenue line, known as No. 1, and the Guilford line, known as No. 11. On the new route the No. 11 cars use the Guilford Avenue elevated road, which saves considerable time. Moreover, residents of the Guilford section now reach the downtown shopping district without transferring. The company has cut the headway of the line from fifteen to ten minutes. to ten minutes.

New York, N. Y. — Samuel Untermyer, special counsel for the city, has refused the proposal of Justice Frankenthaler to send the Interborough Rapid Transit fare case before a referee. Mr. Untermyer stresses his intention to restrict the case to the simple issue of the Transit Commission's power to alter the contract rate fixing the fare at 5 cents.

Louisville, Ky .- The Public Utilities Bureau has announced that it has suggested to the Louisville Railway that several stops be eliminated on various lines, since these stops are close to other stops and comparatively few passengers ever enter or leave cars at the locations. The Louisville Railway is studying the situation with a view to increasing speed on all its lines. Dropping of stops where they are not absolutely neecssary is a help in faster schedules.

Boston, Mass.-Rapid transit service to Milton will be started at the Ashmont end of the Cambridge-Dorchester tunnel on Aug. 26. The opening had to be postponed from Aug. 17 because of the inability of the Boston Elevated Railway to complete track construction on the high-speed line between Ashmont and The transit department is pushing the work to provide rapid transit all the way from Harvard Square to Mattapan Square, using trains of the Boston "L" from Harvard to Ashmont stations, and high-speed trolleys from Ashmont to Mattapan.

Montreal, Que.-A recent meeting of the local executive committee and the Tramways Commission has revived talk about possible subway construction. The general impression prevails that neither the company nor the city is ready to subscribe to a project involving the expenditure of \$100,000,000. It is learned that, because of the heavy cost, the city might be called upon to help finance the project and possibly to grant ex-clusive concessions to the Montreal Tramways for the building of the underground system.

Recent Bus Developments

350 Miles of Route in Puget Sound System

The transportation department, consisting of North Coast Transportation of the Puget Sound Power & Light Company, Seattle, Wash., Pacific Northwest Traction Company and Portland-Seattle Stage Company, is now settled in its new headquarters on the second floor of Central Terminal.

This new organization consists of all major transportation units belonging to the Puget Sound Company. It includes the two interurban lines between Seattle and Everett and between Bellingham and Mount Vernon; operates over 350 miles of main line stage routes reaching from Vancouver, B. C., on the north to Portland, Ore., on the south, and 42 miles through the White River Valley to Auburn and on into the hills at Enumclaw. Eighty stages are operated, and a check of the payrolls on April 15 shows 384 employees.

It is estimated that the combined gross

It is estimated that the combined gross revenue from the interurbans and stages for the year 1929 will be \$2,225,000.

At the start of the summer season eight

At the start of the summer season eight new stages were placed in service on the Seattle-Vancouver, Portland-Seattle routes, to help materially in the handling of vacation business and give equipment sufficient to permit many of the stages now in operation to be placed in the paint shop. All of the stages will be known as the North Coast Lines.

the North Coast Lines.

Work on the new depot at Tacoma, which will be known as Central Terminal, was completed so that the structure could be opened for business by June 1. The opening of this depot permitted stages to be loaded under cover instead of on the streets as at the present time. It also helped the company in handling the Tacoma business, as practically all passengers come to the terminal to board the stage instead of being picked up along the streets, the method employed at present.

New Buses for Gadsden

Delivery has been made to the Alabama Power Company of four new buses recently purchased for use in Gadsden to meet the additional demand for transportation facilities resulting from the industrial activities at the Goodyear Plant and for the replacement of the old bus now in use on Ewing Avenue Line. The chassis are equipped with 29-passenger street car type bodies. A feature of the huses is the Tropic-Aire heating system, which utilizes the heat from the cooling water of the engine. A radiator is installed in the front of the bus and is so connected to the cooling water circulating system that the water from the engine jacket can be bypassed through this radiator before it passes to the radiator in front of the engine. The heat is then circulated through the bus by means of a fan placed hehind the radiator. This system gives a clean, odorless and uniform heat. The color scheme is a yellow body trimmed in orange. The fenders and bead are blue and the top gray-green. The inside of the body has a cream colored ceiling, cherry panels and a brown linoleum floor. A garage and shop is now under construction for the maintenance and

storage of the new buses. A 15,000 gallon gasoline tank and pump are also being installed at the garage to carry a supply of gasoline for the buses and for other automotive equipment in use in Gadsden.

De Luxe Bus Service in Baltimore

The United Railways & Electric Company, Baltimore, Md., has been authorized by the Maryland Public Service Commission to establish de luxe bus service between the fashionable Roland Park section of the city and the downtown district. The route will be 6½ miles each way and the fare will be 25 cents one way. Seven de luxe White buses will be used on the line. They will be the last word in comfort. Each will seat nineteen passengers. Company officials hope to have the line in operation by Oct. 1. The Public Service Commission made a slight change in the downtown section of the proposed route, but this met with the approval of the company. A ten-minute headway will be maintained during the peak hours and a twenty-minute headway during the rest of the day. The finish will be Alexandria blue with trimmings of desert sand.

Big Chartered Bus Business

During the last two months the number of buses of the Public Service Co-ordinated Transport, Newark, N. J., chartered by organizations and groups of friends for summer outings has shown a large increase over any similar period since the chartered service was organized. On July 18, the Prudential Life Insurance Athletic Association and its friends chartered 111 Public Service buses to carry some 3,300 persons on an excursion to Asbury Park; on Aug. 2, employees of the Wright Aeronautical Corporation of Paterson chartered 107 buses to take some 3,000 persons on an outing to Lake Hopatcong. Another large order has been received to take members of the Hudson County Republican Club on an outing to Sea Girt. In addition to these large orders several hundred buses have been chartered to individuals and groups of friends for outings.

By Bus and Limited from Indianapolis to Cincinnati

Service over the old Indianapolis & Cincinnati Traction Company's line never did penetrate closer to Cincinnati than Connersville, Ind., but the new company, the Indianapolis & Southwestern Traction Company, which purchased the old road some months ago at receiver's sale, has estab-lished fast bus connection between Cincinnati and Connersville to connect direct with the new railway service, particularly "The Southeastern Limited" trains, which provide unsually fast service. Southwestern limiteds make no local stops, but no extra fare is charged. Seats may be reserved by telephoning the ticket offices. Porter service is provided. Through service by electric railway from Indianapolis to Cincinnati was the dream which circumstances conspired to prevent the late Charles L. Henry from realizing.

Contractual Factory Service Upheld

Employees of the Mount Hope Foundry in North Dighton have a right to associate together and hire a bus to transport them to and from their work. In the action in which this right was established the Eastern Massachusetts Street Railway sought to prevent John Ingham, Dighton, from transporting men to and from their work, but Judge Lummus of the Suffolk Superior Court ruled they were within their rights as was Ingham. Many of the men at the plant live in Somerset. Five years ago they formed a club and hired Ingham to carry them to the foundry in his bus. They said the service by railway was not dependable, but this was denied by the company. While he decided Ingham had the right to transport the employees of the foundry to and from their work, Judge Lummus ruled Ingham should be enjoined from accepting other business. The route from accepting other business. The route of the Ingham bus parallels that of the railway.

Railroad Protests New Service

Contention that the Hart Motor Coach Company secured local licenses for operation of buses in fifteen towns and one city between Winchendon, Mass., and Williamstown, Mass., by way of the Mohawk Trail, for the new corporation known as the Hart Mohawk Trail Lines without divulging the true owners was made when the Massachusetts Department of Public Utilities heard the petition of transfer of the certificate of public necessity to the new concern. Winchendon Selectmen and representatives of the Boston & Maine Transportation Company appeared as objectors.

Counsel for the Boston & Maine said he understood the Hart Mohawk Trail Lines was a subsidiary of the Boston, Worcester & New York Street Railway. He opposed the granting of permits in Western Massachusetts territory because the Boston & Maine operates trains in that territory. The Boston & Maine Transportation Company expressed a willingness to tie up its Gardner and Greenfield line with Winchendon and serve the town.

Substitution Before State Commission

The Westchester Street Transportation Company, Inc., has applied to the Public Service Commission for authority to substitute buses for electric cars on a portion of its route in Tarrytown and Elmsford; town of Greenburg and White Plains. It also seeks to operate buses in Tarrytown and White Plains not included in but forming a route connecting with the White Plains-Tarrytown line.

As noted previously in the ELECTRIC RAILWAY JOURNAL, the various municipalities have consented to the proposed substitution of buses and these will be filed with the commission when it conducts a hear-

ing on the petition.

The extension of routes was formally authorized by the board of directors of the Westchester Street Transportation Company on July 30. The rate of fare proposed is 10 cents for a ride in zone one; 15 cents for transportation between zones one and two, and 25 cents for a continuous ride from zones one to three.

The franchises granted by the several municipalities provide for the removal of tracks on streets where they are not imbedded in the pavement and their removal when the municipalities do paving or repaving.

At any time after ten years the company is to be permitted to terminate the operation of buses and to exercise its rights to operate electric cars on tracks.

No More Meterless Cabs in Worcester

The Worcester, Mass., license board has decided that operation of flat-rate taxicabs, which have been competing with the Worcester Consolidated Street Railway through a 35-cent rate to any place in the city, has proved unsuccessful. The board has not acted to require all cabs to meter the service, but it has refused to grant any more licenses for meterless cabs. The companies that operate cabs on the flat-rate basis are said to be ready to return to the meter basis, but each is waiting for the other to take the initiative.

New Carrier Rules in Oklahoma

Electric railways operating buses over the public highways of Oklahoma, outside of incorporated cities and towns and all other bus carriers, are affected by House Bill No. 19, which considerably increases the taxes on bus operators carrying persons and property between fixed termini or over a regular route. House Bill No. 19 amends Chapter 113. Session Laws of 1923, repeals Scc. 5 of that act. It was approved by the Governor on June 24, and became effective immediately.

The section of the present law which is repealed provides that no vehicle weighing more than 15,000 lb., including its load, shall be permitted to operate over the public highways of the State without special permission of the Corporation Commission. The new schedule of taxes for regular motor carriers operating between fixed termini or over regular routes designated as class "A" follows: Each passenger motor vehicle seating capacity not to exceed seven, 3 mills per mile seating capacity from 8 to 11, 5 mills per mile; seating capacity from 12 to 17, 7 mills per mile; seating capacity from 18 to 23, 9 mills per mile; seating capacity from 24 to 29, 11 mills per mile; seating capacity from 30 to 36, 12.5 mills per mile; seating capacity in excess of 36, 15 mills per mile. The tax is computed on the basis of the number of miles covered in schedule per day for 30 days per calendar month, regardless of whether motor carrier carries out such schedule.

Motor carries engaged in the transportation of property will pay two-fifths of a cent per mile on distances traveled, mileage to be determined on the same basis as applies to passenger motor carriers. Lower taxes are provided for class "B" and class "C" motor carriers. In addition to the above each motor carrier upon filing application with the Corporation Commission for a certificate of convenience and necessity shall pay the commission a fee of \$100 and upon filing an application for transfer of certificate shall pay the commission a fee of \$50.

Direct Service by Bus to Iowa Fair Grounds

The Tri-City Railway, Davenport, Ia., will provide model transportation to and from the Mississippi Valley Fair and Exposition this year, and with the added advantage to riders of transfer privileges, involving a saving in fares. R. J. Smith, general manager, said a few days ago:

"We believe we are in a position this year to realize what has been our desire ever since the fair was inaugurated. The advent of the fair was coincident with the wane of street car travel. Our car lines were not near enough to the grounds to provide direct service, and the bus was still an experimental vehicle of transportation, particularly mass transportation. Nevertheless we were not neglectful in providing motor coach service, such as was possible with the equipment at hand. This year, however, with our reserve fleet augmented by seven new coaches, we will be in a position to offer fairgoers regularly scheduled, dependable service

dependable service.

"Furthermore, we have found it possible to provide transfer privileges which we think will be attractive. While the regular fare of 25 cents on the fair motor coach is not disturbed, yet with returning passengers a transfer is issued to any local line in Davenport. Upon payment of the established fare on any local line a transfer will be issued which on presentation to the motor coach operator reduces the fare to the grounds to 25 cents.

Mount Vernon, N. Y.—There was a brief ceremony in front of the new City Hall Building on Aug. 17, following which representatives of the South Westchester Bus Company, a subsidiary of the Third Avenue Railway, owner of the franchises, and city officials inspected the four routes which were opened for service the following morning. The fare is 10 cents, with a number of transfer points connecting with trolleys.

Pittsfield, Mass.—Early substitution of buses for trolley cars by the Berkshire Street Railway in the southern part of Berkshire County, Massachusetts, is forecast by the action of municipal authorities of Pittsfield, Lenox, Stockbridge and Great Barrington in granting the company's petition for the change. Other towns are expected to take similar action

Worcester, Mass.—The local license board has rejected the petition of the Boston, Worcester & New York Street Railway for a permit to operate through the city on a Boston-Albany bus route. This is the second time the request has been refused. It was made in behalf of the Hart Motor Coach Lines, a Boston, Worcester & New York subsidiary. The Boston & Maine and the Boston & Albany Railroads opposed the application of the Hart lines.

Indianapolis, Ind. — The Greenville Transportation Company has asked the Public Service Commission to remove limitations in the company's certificate for a bus route between Winchester and Union City, in the event the Union Traction Company's petition to abandon its railway line between Muncie and Union City is granted. At present the company operates under a limited certificate issued in deference to the Union Traction Company protest.

Worcester, Mass.—Under an agreement reached between the Selectmen of Millbury and the Worcester Consolidated Street Railway a bus line will be substituted for the present railway line between Millbury and Worcester, the first suburban trolley line built out of this city.

Medford, Mass. — The Boston Elevated Railway has announced restoration of three bus lines in Medford. The North Cambridge-Medford Square bus, the Riverside Avenue line and the North Street Medford-Arlington Center services were changed on Aug. 3 in consequence of operating losses. Officials say the lines as restored must pay if they are not to be withdrawn permanently.

Columbus, Ohio—Sept. 23 has been set by the Public Utilities Commission as the date for the hearing on the plea of the Columbus Railway, Power & Light Company for permission to discontinue railway service between Columbus and Westerville. If the abandonment is authorized, the company will substitute buses. The company says that its losses on the railway line which for years it has operated to Westerville have been steadily increasing. Westerville is about 15 miles from Columbus.

Fitchburg, Mass. — The Department of Public Utilities has ordered that the certificate of public convenience and necessity, granted the Suburban Bus Lines, Inc., in 1926, be revised and amended to restrict the buses from discharging passengers on Main and Summer Streets in Fitchburg between Upper Common and the Lunenburg line. While operating in the opposite direction they are not to stop to take on passengers between the points mentioned. The Fitchburg & Leominster Street Railway asked this restriction.

Bennington, Vt.—The Vermont Public Service Commission has granted the Berkshire Street Railway's petition for a permit to replace trolley service between Bennington and the Massachusetts state line with a bus service. Four buses will be put in service soon, to run every two hours through the day and evening.

Indiana Harbor, Ind.—A temporary injunction restraining Frank Dolatowski, local bus owner, from operating his buses over any of the routes of the Shore Line Motor Coach Company within or between East Chicago, Hammond and Whiting has been granted by Judge Greenwald of the Lake County, Superior Court. The Shore Line contended that Dolatowski is offering it competition in violation of a ruling by the Indiana Public Service Commission.

Pasadena, Cal.—The Pacific Electric Railway has applied to the Railroad Commission for a certificate of public convenience and necessity to operate an auto stage service between Montana Street and Lincoln Avenue in Pasadena, and Woodbury Road and Lake Avenue here, a distance of 4.3 miles. The application is the result of conferences held with representatives of the Altadena Chamber of Commerce and other associations and of the engineering department of the Railroad Commission, at which the company agreed to furnish the proposed service.

Financial and Corporate

O'Fallon Ruling Reflected in Indiana

Commission there modifies its stand in regard to evidence in pending consolidation case

VIDENCE of a change in attitude in EVIDENCE of a change in attitude in the matter of its consideration of valuation factors is contained in order No. 9499 issued by the Indiana Public Service Commission, the purport of which is to rescind, set aside and declare of no effect that portion of an order issued on Oct. 24, 1928, which stated that the commission in the matter of the petition of the Indiana the matter of the petition of the Indiana Electric Corporation, Central Indiana Power Company, Terre Haute, Indianapolis & Eastern Traction Company, et al., "will consider only valuations based upon original cost" in connection with interurban, bus and railway properties.

Order No. 9499 points out that the recent decision of the Supreme Court of the United States in the O'Fallon case makes it clear "that in a matter of this kind it is necessary to consider all pertinent evidence as to the value of the property, as to the cost of reproduction and the cost

of reproduction depreciated.'

The issue goes back to Oct. 24, 1928, on which date the commission approved an order outlining procedure to be followed in the conduct of the cause looking toward the consolidation of the companies In regard to the valuation of mentioned. In regard to the valuation of interurban, bus and railway properties involved, the order included the following

provision:
"As to the interurban, motor bus and street railway properties involved, the commission will consider only valuations based upon the original cost. Appraisals on the basis of the cost of reproduction for the transportation properties would result in valuations too high to be used as the basis for any issuance or exchange of securities. The historic cost of utility property of this kind certainly ought to be a sound basis for consideration of this cause, representing as it does the actual money invested in the property. Appraisals on the cost of reproduction basis reflecting only present day prices would be far in excess of the actual money cost of the property. The commission within the last few months has had an appraisal made of certain interurban property with the result above in-

As the commission now sees it the declaration that it would consider only valuations based upon the original cost of the interurban, bus and railway properties obviously is not in harmony with decisions of the Supreme Court of the United States which must be regarded as controlling in the valuation of public utility property, particularly the recently decided O'Fallon case. In order to arrive at a legal valuation in a matter of this kind, it is necessary to consider all pertinent evidence as to the value of the property involved, including evidence as to the cost of reproduction and the cost of reproduction depreciated. The lon case makes this very clear. The O'Fal-

The commission is now of the opinion that in the conduct of this cause it should hear all pertinent evidence as to the value of all property involved and should not,

before the hearing of any evidence, be committed to a policy which would confine it to an original cost basis only. It is of the opinion that the portion of the order approved Oct. 24, 1928, relating to a consideration of valuation upon an original cost basis only as to interurban, bus and railway properties should be rescinded and ordered that the previously quoted section be deleted.

Louisville Brief Filed

Arguments to uphold its contention for a fare of 10 cents with three tickets for 25 cents are contained in a brief filed by counsel for the Louisville Railway, Louisville, Ky., in the Federal District Court. The brief is the second filed since the hearing, the first being devoted to argument on jurisdiction of the court. The brief concludes with the statement that should the company earn all that the city's testimony suggests and a fair rate of return is no more than 7 per cent, the company would barely earn a fair return on as much as \$21,105,850, "the lowest fair value that could be institled." could be justified even upon the prejudiced testimony of defendants' witness Hubley. On every other basis of computation suggested by the testimony the proposed rates will afford far less than a fair return upon the fair value of plaintiff's property which it has devoted to the public service.

The brief said the favorable rate of return of 1926 is not likely to be equalled in the immediate future at the present rate schedules and cited the falling off in passengers carried in the last five years. The decrease in the period was from 70,204,876 to 66,997,370, the brief said. It set up the value of the property used and useful on the basis of testimony by the various ex-perts as being from \$24,486,000 to more

than \$28,000,000.

Only Liberal Terms Will Promote Flow of Capital

The St. Louis Transportation Survey Commission on July 11 decided to direct its future consideration to the formulation of a contract ordinance which will meet the city charter's provisions relative to street railway and bus company franchises.

Since Governor Caulfield vetoed the terminable permit bill, passed by the last General Assembly, and as he will be the head of the state government until 1933, there is no hope of putting through a similar law in the meantime. The Governor suggested that if the people of St. Louis want the terminable permit plan they can adopt it by amending the city charter, which restricts franchises to a period. The commission asked Rudolph Kelker, its consulting engineer, to draw up a report on the operation of the bus lines of the city.

At the meeting Mr. Kelker read a statement recommending the improvement and modernization of railway equipment, track extensions to newly settled sections and the use of high-speed buses equipped with pneumatic tires. He said that the flow of capital to permit needed improvements to be made will be largely determined by the conditions under which the companies are permitted to operate.

New Haven Finances Its Trolleys

The Department of Public Utilities in Massachusetts has authorized the New Haven Railroad to purchase from time to time Worcester Consolidated Street Railway first and refunding mortgage 20-year 4½ per cent gold bonds, dated Aug. 1, 1910, and similar bonds of the company dated Aug. 1, 1910, bearing extra coupons, making the rate of interest thereon 6½ per cent per annum at not more than the face value of the bonds and accrued interest thereon, for the purpose of facilitating the refunding of Worcester Consolidated Street Railway's funded debt. The department has also approved the purchase by the New Haven of \$300,000, face value, of demand notes of Springfield Street Railway at not more than face value of the notes, plus accrued interest, for the purpose of providing Springfield Street Railway with funds for rehabilitation of its transportation system.

What Will Boston Do About It?

The Boston Herald is asking what, if anything, has been done about co-ordinated It will be recalled that the big transit. job done by the last General Court was the passage of an Elevated bill which creates a Transit District made up of the cities and towns served by the Elevated, its affairs to be managed by five trustees who would study proposed new routes and report on them to a Transit Council. This Council, also created by the act, is to be made up of the mayors and chairmen of selectmen of the communities of the district; recommendations from the trustees, if approved, to be referred by the council to the General Court. The act also authorizes the district to acquire from the city of Boston, with the consent of the Mayor and City Council, all the subways and rapid transit lines which the city now owns in its "pro-prietary capacity," and thereafter to acquire from the commonwealth the Cambridge tunnel. In other words, the act contemplates the unification of the transit system of Greater Boston under centralized management. As the *Herald* sees it, the big item in the program is the taking over of these facilities by the new Transit District. That cannot be done without the favorable action of the Mayor and the Council. The Herald says:

We have been waiting these many weeks for some sign of interest on their part in this extremely important proposal. We do not argue the merits of the plan now, but we do raise the question if it is not high time for the city authorities to take the public into their confidence and let us know their views and probable intentions. Does the city accept, or reject, the act?

Deal for Twin City Company Rumored

According to the Canadian Financial Post rumors are current in St. Paul and Minneapolis that a change in stock control of the Twin City Rapid Transit Company is impending, and it is said that the H. M. Byllesby interests, which control the Northern States Power Company, centering in the cities mentioned, will acquire control and become the dominant factor in a short time. Canadian directors say no hint of any such change had previously reached them. They were unable to offer an opinion as to whether or not the plan was likely to go through. Twin City Rapid Transit Company owns the entire railway systems in St. Paul and Minneapolis. The total mileage of the lines in the cities and throughout the surrounding urban districts, when reduced to single track, covers more than 516 miles. The company also owns all the local bus lines operating in coordination with the railway service. Several suburban bus lines are also under the same ownership.

Relocation Hearing at East Chicago

Public hearing on the appeal of the Chicago, South Shore & South Bend Railroad from the refusal of the City Council of East Chicago, Ind. to permit the railroad to relocate its tracks there were conducted by the Public Service Commission on Aug 6

Commission on Aug. 6.

Notice of the company's intention to prosecute its appeal, which was filed last May, recently was served on the East Chicago board of public works after officials had been advised by the board that, in view of the City Council's refusal to take any action in the matter, it would be futile to pass a new franchise.

it would be futile to pass a new franchise.

Negotiations looking toward the removal of the South Shore Line tracks from Chicago Avenue, the principal business artery, and the construction of a new right-of-way through the south portion of the city were begun nearly a year ago. The original franchise, providing for removal of the tracks to grade location along the Grand Calumet River, was approved by the board of works last December and was sent to the City Council with favorable recommendations. During the ensuing months, however, the franchise has been held in committee.

Property at Hammond to Be Sold

Suit for foreclosure and application for the appointment of a receiver for the Hammond, Whiting & East Chicago Railway has been filed in the United States District Court in Hammond, Ind., by the First Union Trust & Savings Bank, Chicago, and Emile K. Boisot of California, trustees under the mortgage.

The bill was filed by F. C. Crumpacker of the law firm of Crumpacker & Fredricks, counsel for the trustees. He alleges that the street railway has defaulted in payment of interest on its first mortgage bonds

since Feb. 1, 1923.

It is expected that sale of the property under the foreclosure proceedings will result from the filing of the suit by the trustees. A syndicate of local business men of East Chicago, Whiting and Hammond has been formed to bid for the property if it is put up for sale in the Federal Court. The Midland Utilities Investment Company has a minority interest in the syndicate.

The Hammond, Whiting & East Chicago

The Hammond, Whiting & East Chicago Railway operates a system of electric railways in Hammond, Whiting, East Chicago and Indiana Harbor. The service of the railway is interconnected with that of the

Chicago Surface Lines.

Minnesota Road Sold at Foreclosure

The Minneapolis, Anoka & Cuyuna Range Railway, Minneapolis, Minn., was sold on Aug. 20 to W. D. Lovell, contractor and engineer, for \$25,000, subject to approval by the Federal Court. Mr. Lovell announced no plans for the road, which operates as a trolley line between Minneapolis and Anoka, Minn. The sale was conducted by E. P. Burch, who has oper-

ated the line two years or more under receivership. The sale was to satisfy claims of bondholders, the trustee being the American Mortgage Company of Boston, Mass. The road started in 1913 as the Minneapolis & Northern equipped with gas-electric engines. It has 16 miles of trackage and operated 12 mider lease. It has two electric locomotives, six electric cars and shops and stations. It is now fully electrified.

Railway and Bus Associates Buys Pennsylvania Properties

The United Power & Transportation Company, Philadelphia, Pa., has sold its interest in the Schuylkill Valley Traction Company and the Lebanon Valley Street Railway to the Railway & Bus Associates. Unofficially the purchasers are believed to be Associated Gas & Electric Company.

Oakland, Cal.—The period for the deposit of securities of the Key System Transit Company under the reorganization plan has been extended to Sept. 20.

Philadelphia, Pa. — The disputed extra dividend of \$600,000 announced by the Philadelphia Rapid Transit Company several weeks ago has been distributed, the way having been cleared by the withdrawal of a taxpayer's suit seeking to block the transaction.

Hudson, N. Y.—Application will be made to the Public Service Commission by the Eastern New York Utilities Corporation for authority to abandon the trolley line between Albany and Hudson, as a result of action taken by the directors of the New York Power & Light Corporation.

Pensacola, Fla. — The Gulf Power Company plans to suspend operation of trolley cars on the Belt line, which serves the residential section of Pensacola near Pensacola Bay.

Newark, N. J.—A hearing will be held here on Sept. 25 by the Public Utilities Commission on the application of the receivers of the Morris County Traction Company for permission to dissolve the company. Public Service Co-ordinated Transport is now furnishing service by bus over the route of the supplanted trolley between Newark and Dover.

Plattsburgh, N. Y.—The Public Service Commission has consented to the abandonment by the Plattsburgh Traction Company of a portion of its route known as the north loop of the Belt Line here, a distance of 1.52 miles. The city authorities were in accord with the plan and permission to discontinue service and remove the tracks has been granted by the Common Council.

Dover, N. H.—The Central Park Theater here, owned by the Massachusetts Southeastern Railway, was destroyed by fire on Aug. 6 with a loss of \$20,000. The stock company playing at the theater lost costumes and scenery.

Salem, N. H. — The Massachusetts Northeastern Street Railway will self Canobie Lake Park at Salem, N. H., at public auction on Sept. 14. The park covers about 50 acres. There are many pavilions, buildings and a dance hall. The railway will also self the brick carhouse and other property at the park.

Conspectus of Indexes for August, 1929

Compiled for Publication in ELECTRIC RAILWAY JOURNAL by

ALBERT S. RICHEY
Electric Railway Engineer, Worcester, Mass.

v . r 17

		Month	Year	Last 5	Years
	Latest	Ago	Ago	High	Low
Street Rallway Fares* 1913 = 4.84	Aug.	July	Aug.	June	Jan.
	1929	1929	1928	1929	1924
	7.76	7.76	7,65	7.76	6.91
Electric Rallway Materials* 1913 = 100	Aug.	July	Aug.	March	Feb.
	1929	1929	1928	1924	1928
	146.4	147.5	142.5	163.9	139.5
Electric Railway Wages* 1913 = 100	Aug.	July	Aug.	Aug.	Jan.
	1929	1929	1928	1929	1924
	231.0	230.0	229.7	231.0	217.4
Am. Elec. Ry. Assn. Construction Cost (Elec. Ry.) 1913 = 100	Aug.	July	Aug.	March	July
	1929	1929	1928	1924	1929
	200.8	199.0	204.5	206.8	199.0
Eng. News-Record Construction Cost (General) 1913 = 100	Aug.	July	Aug.	March	Nov.
	1929	1929	1928	1924	1927
	205.9	204.8	207.3	224.7	202.0
U.S. Bur. Lab. Stat. Wholesale Commodities 1926 = 100	July	June	July	Nov.	April
	1929	1929	1928	1925	1927
	98.0	96.4	98, 3	104.5	93.7
Bradstreet Wholesale Commodities 1913 = 9.21	Aug.	July	Aug.	Dec.	July
	1929	1929	1928	1925	1924
	12.63	12.49	13.19	14.41	12.23
U. S. Bur. Lab. Stat. Retail Food 1913 = 100	July	June	July	Nov.	May
	1929	1929	1928	1925	1924
	158.5	154.8	152.8	167.1	141.0
Cost of Living Nat. Ind. Conf. Bd. 1914 = 100	July	June	July	Nov.	April
	1929	1929	1928	1925	1929
	161.6	160.0	161.1	171.8	159.3
Elec. World—Kwhr. used 1923-25 = 100	July 1929 129.2	June 1929 135.2	July 1928 120.2	Feb. 1929 140,4	July 1924 73.4
Bank Clearings Outside N. Y. City 1926 = 100	July	June	July	Feb.	May
	1929	1929	1928	1929	1924
	197.8	102.2	100.7	110.1	84.4
Business Failures Number Liabilities (Millions)	July	June	July	Jan.	Sept.
	1929	1929	1928	1924	1928
	1581	1477	1455	2231	1348
	102.09	64.22	32.07	122, 95	23.13

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population. Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen. conductors and operators on 136 of the largest street and interurban railways operated in the United States, weighted according to the number of such men employed on these

Personal Items

Brooklyn Surface Lines Personnel Announced

William Siebert, long in service, in charge under Mr. Menden. Many other changes made

NCIDENTAL to the unification of the I NCIDENTAL to the unincation of surface lines of the Brooklyn-Manhattan Transit Corporation and the Brooklyn City Railroad as the Brooklyn & Queens Transit Corporation on July 1, many changes were made in the surface transportation departmade in the surface transportation department. William Siebert continues at the head of this department; S. S. Hamilton remains assistant superintendent of transportation; C. A. Drew as superintendent of schedules; W. E. Box as superintendent of amployment and instruction and Wilof schedules; W. E. Box as superintendent of employment and instruction, and William Luhrssen as chief clerk. F. J. Brennan joined Mr. Siebert's staff as assistant to the superintendent of transportation.

Mr. Brennan previously was assistant superintendent of transportation of the Brooklyn City Railroad. The activities of the employment and instruction divisions for the surface lines have been centralized under Mr. Box, except as to badges and photographs. This change eliminates the separate employment, instruction, badge and photograph divisions of the Brooklyn City photograph divisions of the Brooklyii City Railroad. In connection with the merger of the surface lines, a number of changes in the assignment of division superintend-ents, day depot masters and night depot masters were made by Mr. Siebert. These were noted in detail in Electric Railway JOURNAL NEWS for Aug. 3, page 115.

MECHANICAL DEPARTMENT UNDER W. G. GOVE

The mechanical department of the Brooklyn & Queens Transit Corporation is headed by W. G. Gove, and L. J. Davis is engineer of car equipment. Mr. Niles is engineer of car equipment. Mr. Niles Persons continues as superintendent of surface line shops and P. S. Scott is made general inspector. S. Engebrethson, formerly general foreman at 52d Street shop, was transferred to Fresh Pond shop in the same capacity. The new foreman at 52d Street shop is W. F. Platt, formerly foreman carpenter there. In the inspection shops, George Siebert as foreman was placed in charge of both the 9th Avenue and Franklin Avenue shops. C. L. Knight and Franklin Avenue shops. C. L. Knight also is foreman in charge of both the 24th

also is foreman in charge of both the Street and Nostrand Avenue Garage.

H. J. Kolb becomes chief engineer, way for the new company. The and structure, for the new company. The Surface Roadway Division has its headquarters at 849 Nostrand Avenue and F. L. Finch is head of the division. The former headquarters of Mr. Finch, as head of the B.-M. T. surface track division at Smith and 9th Streets, will no longer be used as track division headquarters. W. H. Whartrack division headquarters. W. H. Wharton is superintendent of buildings for the new company and retains his headquarters at 1130 Atlantic Avenue. T. Neilson becomes assistant superintendent of buildings. C. E. Wilcox joins Mr. Kolb's staff as office assistant in charge of records and correspondence and J. A. Rosenberger as special inspector.

Interest naturally centers around Mr. Siebert, the man who will direct the operat-

ing of the 500 or more miles of surface lines with their 1,200 cars, and who pre-sumably will be responsible for the opera-tion of the company's motor bus lines when the event of their operation emerges from the tangled meshes of consideration by city officials. Mr. Siebert is one of life's mystery men-men known widely and favorably in their own communities but still escaping the spot light of publicity. even Harding, Pulitzer prize-winning cartoonist, when he was on the Brooklyn Eagle, discovered Mr. Siebert, or if Harding did discover him then the elusive Mr. Siebert had his own way again and succeeded in escaping publicity. It is a way that has made Mr. Siebert camera-shy to the extent that the ELECTRIC RAILWAY JOURNAL could not secure any portrait of him suitable for half-tone reproduction. That's how diffident is Mr. Siebert.

But about the man. Over in Brooklyn in 1928 at a banquet to him, more fragmentary facts about him came to light than ever before. The occasion was the completion by him of 40 years of service with the surface lines there. Many of the men who attended had worked with Mr. Siebert for years, but in addition there were the county clerk, Supreme Court justices, and others prominent in public life.

From this, that and the other sources, it appears that Mr. Siebert began his railroad career in 1887 as a conductor on the Nostrand Avenue horse-car line. His advance through the ranks was steady until he finally was in charge of the Ridgewood his appointment to the post of superintendent of transportation of the surface lines in 1907. Then came the turning point-

MR. SIEBERT'S APPRECIATION OF THE WORK OF THE RANK AND FILE

Out of a clear sky one day about twenty years ago, Mr. Menden, now the president in Brooklyn, sent for Mr. Siebert to come downtown and see him. When Mr. Siebert arrived at Mr. Menden's office, he told Mr. Siebert he wanted him to take the job of superintendent. Here's Mr. Siebert's own

version of what took place:

"I told him I did not want the job as nobody seemed to last long in that job, and I had a family to take care of. said he thought I would be able to handle myself satisfactorily in the job and finally myseit saustactorily in the job and maily told me to take a week to think things over and then come back to see him. I went back a week later and told him again that I didn't want the job. But I didn't know he had been talking with Harry Crowe and some of the others who knew me downtown and they had told him just to tell me to try my hand at the joh and I would stick at it. At any rate, when I told him I still didn't want the job, he simply said he'd have to have someone downtown and asked me to go inside and help him out temporarily. That was

more than twenty years ago and I'm still

helping out.

He has no mistaken notions about things. He can do most anything in railroading, has done most everything, and, when occasion requires, still does most everything, but knows that as a policy that is a mistaken one. He can delegate tasks and he does delegate them. In a gracious compliment to the men under him, Mr. Siebert once said:

"One man cannot run a railroad. We sometimes say we are running it but that isn't true. We must have the co-operation and support of every man in the organization from switch-boy to president, and unless we have that our efforts to run the rail-road to satisfy the public and the management are bound to fail. I have been for-tunate in having enjoyed that loyalty and support in a generous degree and I owe all of whatever success I have achieved to each and every one of you."

No encomium to the man could possibly

give a better clue to the underlying philosophy that is Mr. Siebert's than this statement made on one of the very few occasions on which he broke his customary

B. C. Cobb Elected to Commonwealth & Southern Board

B. C. Cobb, New York, chairman of the board of the recently organized Common-wealth & Southern Corporation, has been clected a director of the Georgia Power Company; Magor Car Company; Pullman E. Patterson, Macon, Ga. Mr. Cobb also is the chairman of the board of the Allied Power & Light Corporation, and for three years served as chairman of the advisory council of the American Electric Railway Association.

Railway Association.

Mr. Cobb is president of the Tennessee Electric & Power Company and a director of the Nashville Railway & Light Company. He is also president of the Commonwealth Power Company and the Penn-Ohio Edison Company, which, together with other public utilities, were recently consolidated with the Southeastern Power & Light Company.

& Light Company.

Mr. Cobb was born in Boston on Aug. 13, 1870, and after leaving school was first employed by the Pennsylvania Railroad. Later he was one of the organizers of Hodenpyl, Hardy & Company. In 1928 this company and Stevens & Wood, Inc., were acquired by the Allied Power & Light Corporation, of which Mr. Cobb became chairman.

C. C. Brown in the Quarter Century Club

Chester C. Brown, auditor of the New York State Railways at Syracuse and Utica has completed 25 years of service. Utica has completed 25 years of service. Mr. Brown entered the employ of the company on July 1, 1904, when, under Hague, Comstock & Walker, managers and construction engineers of the Rochester & Eastern line, he accepted a position in Canandaigua. His first job was that of reight handler. After about six months, he was promoted to freight agent at the Canandaigua office. Still later the same year, Mr. Brown was appointed general freight and express agent of the Rochester & Eastern, which position he held for about two years. Following this, he occupied the position of paymaster on the Rochester & Eastern and Rochester & Sodus Bay lines.

In February, 1907, following the change of ownership, Mr. Brown was placed in

charge of the Canandaigua office, where he remained until 1909, when he was transferred to the Rochester office. In August. ferred to the Rochester office. In August, 1919, he was appointed chief clerk by J. M. Joel, general auditor, and served in that capacity until Dec. 1, 1923, at which time he was appointed auditor of Utica, Oneida and Syracuse lines, with head-quarters at Utica. He becomes the 341st member of the company's Quarter Century

Darius E. Peck Elected Vice-President of General Electric

Darius E. Peck, assistant manager of the law department of the General Electric Company since 1920, has been elected vicepresident and general counsel of the com-At the same time Allen H. Jackson, vice-president and general counsel since 1922 and associated in the company's law department since 1902, retired from active service, having served the company

wisely, ably and loyally.

Mr. Peck was born at Hudson, in 1877. He is a graduate of Williston Academy at Easthampton, Mass., and of Yale University. He was admitted to the bar in 1901. He practiced law in New York City from 1902 until 1913, when he became a member of the law department of the General Electric Company and moved to Schenectady. Seven years later he was named assistant manager of the department, a position he held until his promotion to vice-president and general counsel.

Mr. Peck has also had considerable experience in the public utility field. In 1915 he was elected secretary, treasurer and a director of the Schenectady Illumiand a director of the Schenectady Illumnating Company, the Mohawk Gas Company, and the Schenectady Power Company, succeeding James O. Carr. In 1920, at the time of the organization of the Adirondack Power & Light Corporation, he was elected a director and secretary and served for several years. When the Mohawk Hudson Power Corporation was formed in 1925 he became secretary of that company, serving until April of this year. He is at present a director of the New York Power & Light Corporation.

Mr. Jackson was born in Schenectady in 1864. He was graduated from Union College in 1886 and from the Albany Law School two years later. He entered the office of his father, Judge Samuel W. Jackson, of the State Supreme Court, and practiced law in his home city until 1892, when he went to New York with the law firm of Chanler, Maxwell & Philip. Three years later he returned to Schenectady and entered into partnership with his father. This association continued until 1902.

Beginning about 1900, Mr. Jackson had is first contact with General Electric affairs, previous to his actual entry into the company's organization. It was at this period that the National Electric Lamp Association was undergoing organization at Cleveland. At the request of the late Hinsdill Parsons, general counsel of the General Electric Company, Mr. Jackson assisted in bringing about the formation of the national association. His work at that time was a forerunner to his direct employment by the General Electric Company in December, 1902, as one of its attorneys, under Mr. Parsons. Mr. Jackson 1901 became counsel to the company in 1911, and after Mr. Parsons' death in 1912, he became the head of the law department.

In 1922, the year in which Gerard Swope succeeded E. W. Rice, Jr., as president of the company and Owen D. Young succeeded the late Charles A. Coffin as chairman of the board, Mr. Jackson was made vice-president and general counsel.

Coach Company Promotes I. E. McCarthy

John E. McCarthy has been elected a vice-president of the Fifth Avenue Coach Company, New York. He will continue to serve as secretary and his title is vice-president and secretary. Mr. Mc-Carthy's career with the Fifth Avenue Coach Company began when he started to work as a stenographer in 1914. Within two years of his entering the service he was appointed general bookkeeper. In that capacity he handled the accounts of four corporations and became so thoroughly familiar with the business that he was made chief clerk in 1918. In 1922, Mr. McCarthy was transferred to the president's office and received the title of control of the president's office and received the title of assistant to the president. On Nov. 5, 1924, he was appointed assistant secretary of the company, and on March 1, 1925, he became secretary, succeeding in that capacity Samuel E. Morrow, who retired at that

B. G. Noah General Superintendent at Duluth

B. G. Noah has been appointed general superintendent of the Duluth Street Rail-way, part of the Duluth-Superior Traction, in charge of all departments of operation in Duluth, Minn., and Superior,



G. B. Noah

For the past two years Mr. Noah has held the position of assistant to the vicepresident, going to Duluth from Chicago where, for ten years, he was connected with the Chicago Surface Lines as electrical engineer in charge of power station design and electrical testing. Mr. Noah received his technical training in electrical engineering in Chicago.

The principal departments of operation which will be under Mr. Noah's direction are: Engineering and roadway department under John Carson, chief engineer and T. A. Armstrong, roadmaster mechanical department under R. J. Crawford, master mechanic; the operating departments in Duluth and Superior under William S. Byers, superintendent, Duluth division, and Alfred Williams, superintendent, Superior

division, and schedules and publicity under R. B. Thompson, superintendent of schedules. Herbert Warren, vice-president and gen-

eral manager of the company, explains in a bulletin announcing the appointment, that "the increasing burdens of management other than operation, make the change necessary.

Preston S. Arkwright, president of

the Georgia Power Company, has been elected president and member of the directorate of the Columbus Electric & Power Company. The Columbus company is a subsidiary of the Commonwealth & Southern Corporation, which, through the Southeastern Power & Light Company, likewise controls the Georgia Power Company.

Harold Smith Elected Vice-President of Westinghouse

Harold Smith, general solicitor of the Westinghouse Electric & Manufacturing Company, has been elected vice-president. Mr. Smith entered the legal department of the Westinghouse Company in 1919 and was appointed general solicitor in 1926. Prior to that time he was engaged in the practice of law in Chicago being a member of the firm, Glennon, Cary & Walker. He is a graduate of Northwestern University (LL.B. in 1905), and at Yale (LL.M. in 1906), and he also studied at the University of Chicago. He is a member of the bar of the States of New York and Illinois.

John C. Higgs, for five years chief engineer of the power station of the Jacksonville Traction Company, Jack-Jacksonville Traction Company, Jacksonville, Fla., is to be transferred to Tampa, where he will become assistant superintendent of the power station of the Tampa Electric Company. The Jacksonville Traction Company and the Tampa Electric Company are under executive management of Stone & Webster, Inc. T. J. Hunt, chief engineer of the Winter Haven Power & Ice Company. will succeed Mr. Higgs at Company, will succeed Mr. Higgs at Jacksonville.

Frank J. Miller, appointed by Governor Patterson as a member of the Oregon Public Service Commission to fill the vacancy caused by the death of Louis E. Bean, has been elected chairman, the post occupied by Mr. Bean at the time of his death. Mr. Miller was the first secretary of the original Oregon Railroad Commission, serving from 1891 to 1893. In 1909 he was elected as a member of the Railroad Commission, and later was appointed to serve out an unexpired term. In January, 1910, Mr. Miller took office on his election as commissioner, serving continuously until January, 1919.

E. D. Spicer, superintendent of the refrigeration department of the General Electric Company, has been made assistant manager of the Schenectady works. Mr. Spicer was graduated from Cornell University in 1912 with the degree of mechanical engineer. In 1924 he went to the General Electric Company in the manufacturing general de-partment. In December of the same year, he joined the staff of James A. Smith, superintendent of the Schenectady works, and, in March, 1925, he was placed in charge of the insulator and carbon brush department.

H. W. Olcott, Jr., has been transferred to Indianapolis and promoted to the position of manager of publicity and advertising there for the Interstate Public Service Company and Central Indiana Power Company subsidiaries—a group of electric, gas, and local and interurban railways, absorbed early this year by the Midland Utilities Investment Company, with which he is now associated as assistant publicity director.

1. K. Bruce Under New London Scale

The London County Council has decided that the scale of salary attaching to the position of general manager of the Council's tramways shall in future be £2,000 a year, increasing after four years service at that remuneration by annual increments of £250 to £3,000 a year. J. K. Bruce, who has been general manager for several years, is transferred to the new scale, and his salary is now increased to £2,500, increasing thereafter in accordance with the scale.

C. E. Eveleth Vice-President in G. E. Engineering Department

Charles E. Eveleth, who since 1927 has been a vice-president of the General Electric Company associated with C. C. Chesney and W. R. Burrows in the Chesney and W. R. Burrows in the management of the manufacturing department of the company, has been transferred to the engineering department, and, as vice-president, will be associated with E. W. Allen in the direction of that department's affairs.

Mr. Eveleth will give special attention to the problems of the designing de-partments and works laboratories. Mr. Allen will direct his attention to the

work of the commercial engineering, the contract service and district engineering departments.

Mr. Eveleth has been in the employ of the General Electric Company since 1899.

H. R. Cranford, the Toledo Edison Company, Toledo, Ohio, has accepted the chairmanship of a new committee of the National Association of Purchasing Agents, Inc., to be known as National Committee
To Co-ordinate Activities of Affiliated Associations. The object of the committee will be to assist affiliated associations in the several districts to schedule their various activities to co-ordinate with those of other

associations in the same district.

Fred N. Wardwell, formerly assistant engineer of the New York Central Lines, has joined the Rome Wire Company, Division of General Cable Corporation, as railroad sales engineer. He will be located at the division's executive office at Rome, N. Y. Mr. Wardwell has had wide railroad experience. During the past eleven years with New York Central, he has been closely identified with the electrification and equipment projects of its lines, having had direct supervision of the material inspection bureau of the electrical department. He was also technical advisor to the purchasing and stores department.

Obituary

Charles Currie

Charles Currie, former vice-president and general manager the Northern Ohio Power & Light Company, Akron, Ohio, with which he was actively connected from 1901 to 1916, died on Aug. 14 while on a motor trip in Massachusetts.

Mr. Currie was born in Toronto, Ont., on March 8, 1868. The family moved to London, Ont., and at an early age Mr. Currie went to work for the London Street Railway. Later he became superintendent of that company.

When the Everett-Moore Syndicate took over the London Street Railway and a number of other utilities in Canada and the United States, Mr. Currie was made superintendent of railways at Lima, Ohio. Later he was transferred to Cleveland as superintendent and went thence to Akron, finally becoming vice-president and general manager. When the Hodenpyl-Hardy interests took over the Northern Ohio Power & Light Company in 1916, Mr. Currie returned to Cleveland to join the Cleveland Trust Company. At the time of his death he was a director of the Northern Ohio Power & Light Company, president of the London Street Railway and a director of the Lake Shore Electric Company. Mr. Currie was 61 years old.

Gaylord Thompson

Gaylord Thompson, general manager of the Trenton & Princeton Traction Company, Trenton, N. J., died on Aug. 15. He had been ill for a long time and had been confined to his home for the past two years.

Mr. Thompson was a native of New York City. He was graduated from New York University in civil engineering. He

later became affiliated with the Ohio Electric Company in Cincinnati. Sixteen years ago he removed to Trenton and was made general manager of the Trenton & Princeton Traction Company. He was a member of the American Society of Civil Engineers and the Trenton Engineers' Club.

Ora Taylor

Ora Taylor assistant superintendent of the southern division of the Pacific Electric Railway, Los Angeles, Cal., died on July 28. Mr. Taylor was 59 years of age. He went to Los Angeles 28 years ago from Knoxville, Ia. He entered the service of the Pacific Electric Railway in August, 1912, as a conductor's instructor on the western division. One year later he was appointed trainmaster of the western division, which position he held until January, 1920, when he was appointed assistant superintendent of the southern division.

A. K. Baylor

Armisted K. Baylor, General Electric commercial engineer and veteran of the electrical industry, died suddenly on Aug. 1. In 1891 Mr. Baylor went to the Thomson-Houston Electric Company at West Lynn, Mass., and moved to Schenectady, N. Y. in 1894, when the headquarters and main offices of the company were established there. In 1896 he became manager lished there. In 1896 he became manager of the traction department of the British Thomson-Houston Company, later becoming general sales manager abroad. After fourteen years he re-entered the General Electric organization in the United States, and for several years was in the commercial general department. Mr. Baylor was 61 years old.

Daniel Corliss Frost

Daniel Corliss Frost, manager of the Lynchburg Traction & Light Company, Lynchburg, Va., died on July 23. He had been in a coma for several days when he suffered a second attack of a malady which had affected him since last April.

Though exceedingly modest in demeanor, Mr. Frost was widely known and held in high regard locally. He went to Lynchburg to manage the plant known as "The Spoke Works," which, after a few years' operation by the Philadelphia owners, was closed. He held several positions as manager of industrial plants in Lynchburg and was for a short time with the Chesapeake & Ohio Railway before taking the position as superintendent of the local railway late in 1902. This position he held until about a year ago when the gas company was separated and he became manager of the railway service.

He took an active interest in public affairs in his early years in Lynchburg and during the incumbency of Mayor G. Woodson Smith was a justice of the peace. He was a member of the Rotary Club, Club, Oakwood Country Club, Sphex Club, Chamber of Commerce, a director in the Interstate Fair Association and the Com-mercial Savings & Loan Bank. He was mercial Savings & Loan Bank. He was interested in the collection of first editions and particularly interested in books on Virginia and Abraham Lincoln.

He attended the public schools in Philadelphia but went to work early in life with the Charles Scott Wheel Manufacture of the Charles Sco

turing Company, which sent him to Lynch-burg. He was born at Laurel, Delaware.

Edward Early

Edward Early, assistant treasurer of the United Railways & Electric Company, Baltimore, Md., died on Aug. 2. He was 64 years of age. He was stricken with a heart attack while in his office in the Court Square Building and died soon afterward. Mr. Early was a native of Baltimore. He was educated in the public schools there. A number of years ago he entered the treasurer's office of the Western Maryland Railway and in 1913 joined the treasurer's office of the United. He was made assistant treasurer about a year later.

New Franchise Draft in **Tacksonville**

Austin Miller, city attorney of Jacksonville, Fla., has been requested by the public service committee of the City Council to "fair and legal" Jacksonville prepare a Traction Company franchise for the committee's consideration.

The text of the letter to Mr. Miller fol-

lows in part:

"In view of the fact that you are familiar with the former franchise, which was re-pealed, this committee feels that it is your province to prepare a draft of a proposed franchise that will be fair, just and equitable to the city and to the Jackson-ville Traction Company. To the end, therefore, that this important matter may be disposed of without unnecessary delay, the committee requests that you prepare a franchise you think fair and legal, and that you furnish the committee with a draft thereof within the next 30 days.

Since the repeal of the former ordinance each side has made concessions, the attitude of the company toward a new grant being reviewed in Electric Railway Journal News for Aug. 10, page 118.

Industry Market and Trade News

Bids Received for Equipment for New York's New Subway

Final bids for steel cars, substation power and motor equipment on New York's new Manhattan subway were opened on Aug. 20 by Commissioner Daniel L. Ryan of the Board of Transportation and referred to the engineering department for computation.

For the installation of motors and control equipment, the Westinghouse Company bid \$2,532,470 and the General Electric Company \$2,547,070.

Bids were received for the 300 steel cars to be used from the following five companies: The American Car & Foundry Company; Magor Car Company; Pullman Car & Manufacturing Corporation; the Pressed Steel Car Company, and the Standard Steel Car Company. ard Steel Car Company.

These five bids were made on tabulated items and not for a lump figure. They will be computed by the board's engineering department and the total bids in each instance announced as soon as computed.

The delay in specifying the amounts entailed in the bids by the car manufacturers, it was explained, results in the fact that this is the first time in history that the city of New York has received, opened and computed bids for its own rapid transit.

Four bids were also received for installation of power equipment for substations of the new subway. These bids, ten-dered by the General Electric Company, Westinghouse Electric Company, Fishbach & Moore, Inc., and the Erickson Engineering Company, Inc., were also referred for computation to the engineering department.

All bids for the subway work are now in, with the exception of the one for the illu-

mination of the new circuit.

Examination will begin before the Board of Transportation within a day or two on the reliability and experience in such construction work of the concerns involved in the bidding.

Recent Bus Orders

The electric railway industry continues to be one of the principal purchasers of bus equipment, and new orders are being placed without interruption. The Wheeling Traction Company, Wheeling, W. Va., recently ordered five 20-passenger Studebaker parlor car buses, while the Eastern Massachusetts Street Railway, Boston, Mass., ordered four Studebaker 21-passenger de luxe street car buses. The Brooklyn & Queens Transit Corporation of Brooklyn, N. Y., accepted delivery of four A.C.F. 33-passenger street car type buses, leased for a period of onc year, and to the Boston Elevated Railway of Boston, Mass., were delivered five A.C.F. 40-passenger Metropolitan coaches. The Virginia Electric & Power Company recently placed an order for ten Twin Coaches of the 40-passenger urban type with the Twin Coach Corporation of Kent. Ohio, while the Denver Tramway Corporation ordered one 23-passenger A.C.F. urban coach from the A.C.F. Motor Company and one Mack 29-passenger city type bus.

The El Paso Electric Company recently placed an order for one White 54-A bus.

Yellow Coaches were ordered by various bus divisions of electric railway companies, and the following deliveries were made:

The Atlantic City & Shore Railroad, Philadelphia, received four Z-29 passenger buses; the City Light & Traction Company, Sedalia, Mo., one W city service type bus; the Wisconsin Gas & Electric Company, of Kenosha, Wis., took delivery of one Z-29 bus. Two Z-29 coaches will go to the Illinois Power & Light Company of Champaign III. and the Wisconsin Power Champaign, Ill., and the Wisconsin Power & Light Company of Janesville, Wis., took seven W city service type buses, while four W city service buses were delivered to the Sioux Falls Traction Company at Sioux Falls, S. D., and six buses of the same type were accepted by the Potomac Edison Company of Hagerstown, Md. An order of one bus of the same model was placed by the Erie Coach Company of Eric, Pa. The Capital Traction Company of Wash-

ington, D. C., contemplates ordering three 21-passenger buses. Mack buses were or-dered extensively also by several electric railway properties, and some recent orders

follow below:

The Lehigh Valley Transportation Company, of Allentown, Pa., two model AB pany, of Allentown, Pa., two model AD four-cylinder 29-passenger, city type buses; the Tompkins Bus Corporation of West New Brighton, N. Y., 24 Mack model AB four-cylinder 29-passenger city type buses; the Connecticut Company, New Haven, Conn., three Mack model AB four-cylinder Connecticut type buses; the North-29-passenger city type buses; the North-ampton Street Railway, Northampton, Mass., two Mack model AB four-cylinder Sass., two Mack model AB four-cylinder 25-passenger, city type buses; the Boston-Worcester & New York Street Railway Company, of Framingham, Mass., one model BK 29-passenger parlor car bus and the Buffalo & Erie Coach Corporation of Fredonia, N. Y., has accepted delivery on two model BB four-cylinder 177½-in. wheelbase chassis.

Cleveland's New Electric Locomotives

The first of the 22 electric locomotives for use in the newly electrified railroad zone in Cleveland has been completed at the Erie, Pa., works of the General Electric Company. The locomotives, being the Eric, Fa., Works of the General Electric Company. The locomotives, being constructed by the American Locomotive and General Electric companies, weigh 204 tons each, with 150 tons on the driving wheels, will handle the equivalent of seventeen 75-ton cars, and will have a maximum speed of 70 m.p.h.

W. B. & A. Orders Trailers

Detailed description of the nine trail cars ordered last April by the Washington, Baltimore & Annapolis Electric Railroad for service between Baltimore and Annapolis, announcement of which was made in the June, 1929, issue of ELECTRIC RAIL-WAY JOURNAL, is now available and is pub-

Air brakes Westinghouse ATM
Axles Brill A.S.T.M. A-20-27
Car signal system Westinghouse electro-pneumatic
Couplers Tomlinson MCB tight lock
Curtain fixtures Excel No. 40
Curtain material
Destination signs
Doors
Floor covering N. Y. Belting & Packing Co.
Glass
Hand brakes Peacock
Heat insulating materialSalamander
Heaters Railway Utility Company
Headlining Agasote
Interior trim
Journal bearingsPlain
Journal boxesBrill semi-steel
Lamp fixtures Electric Service Supplies Company
Painting scheme
Roof typeArch
Roof material Poplar, canvas covered
Sash fixtures
Seats
Seat spacing
Seating material
Slack adjusters American Brake Company, type J
StepsStationary
Step treads Kass
Trucks
VentilatorsNichols-Lintern
Wheels

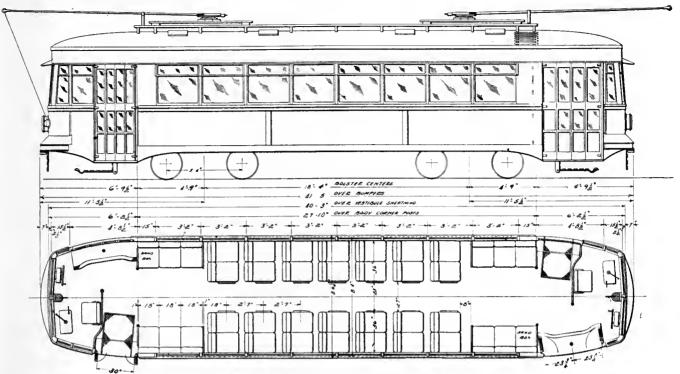
St. Louis Car Company Builds Electric Locomotive

A combination electric switching locomotive was delivered July 16 by the St. Louis Car Company, St. Louis, Mo., to the Illinois Central Railroad for use at the Chicago terminals. The locomotive weighs 90 tons and is designed to utilize any of three different types of power. It cost \$70,000, and was built in 60 days at the St. Louis shops of the car company. The new unit is 45 ft. in length and is provided with 1,000 h.p. in traction motors. It can utilize oil-electric power, trolley or third rail and storage battery.

Although the Illinois Central plans to use the locomotive for switching purposes, it can be used for road freight and will attain a speed of 35 m.p.h. Two 155 h.p. oil engines are used to drive the electrical generators. In its switching operations the locomotive will pull a 3,000 ton train, or the equivalent of 55 loaded freight cars.



Electric locomotive to be used in the electrified zone of the Cleveland Union Terminal



The new Greensboro cars are 41 ft. 5 in. over all and seat 40 passengers

Five Cars for Greensboro, N. C.

The North Carolina Public Service Company, Greensboro, N. C., recently placed an order for five new cars with the Perley A. Thomas Car Works, High Point, N. C. These cars are now being delivered to the railway by the car builder. They are of the double-end type, arranged for one-man service, with front entrance and rear treadle-controlled exit doors. A feature of this car is that the motorman will be seated when operating the controls. The window spacing in front of the car is so arranged that he has a clear view of the street in front of him, and the visibility is not obstructed by wide posts. The flooring of the cars is made up of 1½ in. square rubber tiles of two colors. The total weight of the car is 33,200 lb., and the length over all is 41 ft. 5 in. The length over the body posts is 27 ft. 10 in. and the width over all is 8 ft. 6½ in., while the height from rail to trolley base is 10 ft. 7 in. An all-steel construction is used for the body. The type of car is one-man, double-end, double-truck, and the seating capacity is 40 passengers. A detailed list of the equipment follows:

Air brakes Westinghouse
Car signal systemConsolidated Car Heating Co.
Conduit
Control
Couplers Car builder's
Curtain fixtures Adams & Westlake Company
Curtain materialPantasote
Destination signs
Door mechanism Consolidated Car Heating Co.
Gears and pinionsNuttall
Hand brakes Peacock staffless
HeatersConsolidated Car Heating Company
HeadlightsO. B. illuminated type
Headlining
Lamp fixtures Dome, Dayton Manufacturing Co.
Motors Four Westinghouse No. 51035 H.P.
PaintingEnamel
Registers
Roof material
Sash fixtures Adams & Westlake Company
SeatsDouble deck reversible
Seating material Leather
Slack adjusters American, type E
Step treads, "Kass" Morton Manufacturing Company
Trolley catchers Ohio Brass Company
Trolley base, form 4 Ohio Brass Company
Ventilators
WheelsDavis

Manufacturers!

CONVENTION EXHIBIT

Opens Officially at 9 a.m.
MONDAY, SEPT. 30
The Exhibit Committee desires have everything ready and complete by
SATURDAY NOON,
SEPT. 28

At which time freight doors will be closed

Ship Exhibits Early and Be Ready by Noon Saturday, SEPT. 28

Gears on Montreal Cars

On page 818 of the August issue of Electric Railway Journal it was stated that the 106 new cars for the Montreal Tramway were to be equipped with Nuttall, Grade BP gears. This statement was inaccurate in that only 76 of these cars are to be equipped with Nuttall and 30 with Tool Steel gears, the latter being manufactured by the Tool Steel Gear & Pinion Company, Cincinnati, Ohio. The 25 two-car trains recently ordered will be equipped with Tool Steel gears.

Automatic Block Signals for Illinois Terminal System

The Illinois Terminal System has ordered from Union Switch & Signal Company materials for the installation of automatic blocks signals of the colored light type on about 240 miles of track between Staunton and Peoria, Ill., and from Springfield to Mackinaw Junction, Ill.

Lackawanna Contracts Let

Car and meter awards have been made for equipment for the electrified line out of New York

CONTRACTS for the construction of 141 all-steel electric vestibuled motor cars, equipped with roller bearings, by the Pullman Car & Manufacturing Company, Chicago; the construction of 230 horse-power motors and the necessary control equipment for each of these cars by the General Electric Company, Schenectady, N. Y., and for the conversion of a similar number of the latest model of the present suburban coaches as vestibuled trailer cars by the American Car & Foundry Company, Berwick, Pa., have been made by the Lackawanna Railroad. This equipment is for use on commuter trains connecting Hoboken, Montclair, Gladstone and Dover, N. J., comprising 70 miles of route or 160 miles of track, the electrification of which is now under way. The delivery of completed cars is promised, beginning in June next year. President J. M. Davis of the contracts on Aug. 23.

This equipment can be operated in units of two cars—a motor and a trailer or coupled to form trains of two, four, six, eight, ten or twelve cars. Each motor car will be 71 ft. long and weigh 148,000 lb. complete with electrical equipment, while the trailers will weigh 113,000 lb. each, making the weight of a complete unit 261,000 lb., exclusive of passengers. Each motor car will seat 84 passengers and the trailers 78 or 82 passengers, making a total of 162, or 166 passengers for each unit.

Commuters have repeatedly declared the present coaches are the most satisfactory suburban cars the Lackawanna ever had, but the new equipment will be an improvement over that now in service. They will have the same well distributed lighting arrangement, the same ample knee room between cross seats, slightly wider aisles and be equipped with the most modern type of inclosed electric heaters.

Two-Car Trains for Montreal

Of the 156 new cars which are being ordered by the Montreal Tramways during the present year, the last 50 are to be equipped as complete four-motor units for regular all-day service if necessary, with provision for coupling together for train operation at rush hours. Each of the units of the train is a standard new type car, uniform in size, construction and appearance, with the exception of the straightening of the vestibule platforms for the coupling equipment.

It is intended to operate the second unit as one-man safety cars in all-day regular service on lines suitable for such, but which have very heavy rush-hour traffic. At such periods the units will be coupled to the one-man cars to form the train, the operator of the one-man car taking the duties of conductor of this unit for the time being. of conductor of this unit for the time being. These cars are being equipped with the recently developed Westinghouse variable automatic master control system, Westinghouse 510-A2 motors and Tomlinson mechanical and electrical coupler. An acceleration of the contraction of the co eration of 3 m.p.h.p.s. and a correspondingly higher rate of braking will be obtained by these cars.

Twenty-five of the units will be of the single-end, double-truck, one-man safety type, seating 54 passengers each and weighing approximately 37,600 lb. The other 25 cars will be of the single-end, two-man type, seating 42 passengers. Over-all dimensions of the two types are the same, with a length over the corner posts of 46 ft. 2 in.; width, 8 ft. 4 in., and height from rail to top of trolley board of 11 ft. I in. Bolster centers are spaced 22 ft. 7 in., and the wheelbase is 5 ft. 4 in. Equipment specifications, which are substantially the same on both types, are as follows:

Air brakes..... Canadian Westinghouse Company Safety car equipment type E relay and quick release Armature bearings.... Bronze—babbit lined Axles... 4-in., 41-in. gear seat Bumpere... Hedley anti-climber Car signal system... Faraday, 600 volt Compressor, Canadian-Westinghouse Company

Conduit Standard metal conduit
Control, Westinghouse variable automatic master
control
Couplers Tomlinson form 10
Curtain fixtures National Lock Washer Company
Curtain material Pantasote
Destination signs Keystons
Door mechanism, National Pneumatic Company
GOF, 41-in, M. engine
Doors, foldingFront—air operated
Rear—treadle air operated

Front—air operated
Rear—treadle air operated
Rear—air oper

Motors..... Canadian Westinghouse No. 510-A2, Gear ratio. 42 hp. 13-69 Roof, type Arch Safety car devices Canadian Westinghous-

Kool, type. Arch
Safety car devices ... Canadian Westingbousfull safety equipment
Sanders... O. W. Meissner Company, pneumatic
Sash fixtures ... Metal—Robert Mitchell Company
Seate ... Ottawa Car Mig. Company,
and Canadian Car & Foundry Company
Seat spacing. ... 2 tt. 6 in.
Seating material ... Rattan
Slack adjusters, American Brake Company, form E-1
Steps ... Irving Co., Saf-Kar
Step treada ... Kase
Track scrapers ... M. T. Company standard
Trolley base ... Nuttall Compay US 20-C
Trolley catcher ... Keystone
Trolley wheels, Lyman Tube & Supply Company,
Canadian Ideal wheel
Trucks Canadian Car & Foundry Company
Type F-790
Ventilatora, Railway Utility Company Honeycomb
Wheels Cast iron, 26 in. diameter
Fenders HB fender
Notes—Heaters have Railway Utility Company,
tnermostatic control.

Fifteen Trackless Trolleys for Salt Lake City

The last part of the first paragraph under "Recent Bus Orders Numerous," appearing on page 816 of the August issue of Electric Railway Journal, states that

an order of eleven trackless trolleys have been placed with the Twin Coach Corpora-tion by the Utah Light & Traction Com-pany of Salt Lake City. This statement should read as follows:

"Seven trackless trolley coaches have been ordered from the Twin Coach Corporation, while eight trackless trolleys were ordered from the Cincinnati Car Corporation by the Salt Lake City Company, making a total order of fifteen vehicles of this type."

Details of New Bedford Cars Announced

Additional details are now available by the Union Street Railway, New Bedford, Mass., mention of which was made in the July issue of Electric Railway Journal. The cars are being built by the Osgood-Bradley Car Company, Worcester, Mass., and are practically identical in dr. Mass., and are practically identical in design with cars ordered from the same builder by the Altoona & Logan Valley Electric Railway, Altoona, Pa., and by the Scranton Railway.

The principal items are as follows:

Air brakes, Westinghouse straight air, variable load
Armoture bearings ouse straight air, variable load
Armature bearingsPlain
Axles4j-in.
Car signal system, Consol. Car Heating Company
Compressors DH-16
ConduitMetal
Control Westinghouse "UM"
Destination signs
Destination signs
Door mechanism
DoorsFolding
Energy saving device 100 Amp. Economy Meters
FinishLacquer
Floor covering Flexolith
Gears and pinions
Glass
Class
non-shatterable in vestibules
Hand brakesPeacock vertical
Hand straps Porcelain rail only Henters Gold Car Heating Company
Henters Gold Car Heating Company
HeadlightsO.B. dash illuminating
Headlioing
Interior trim
Interior trim
Journal bearings
Journal boxes. Symington Lamp fixtures, Electric Service Supplies Company,
Lamp fixtures, Electric Service Supplies Company,
Twenty 30-volt lamps
Motors Four 510 E, 35 bp., inside hung
Painting schemePullman green and gold
Degisters
RegistersRooke
Roof typeArch
Root material
Roof materialWood—canvas covered Safety car devicesPassenger emergency valve
Sash fixtures Brass sash
Seats Heywood Wakefield de luve
Seats
StepsStationary
Stationary
Step treads
Trolley base Nuttall lightweight
Trolley wneels
Trucks Osgood Bradley
Ventilators Osgood Bradley exhaust
Ventilators. Osgood Bradley exhaust Wheels, type. Steel, 27 in. diameter
WheelguardsBradley truck guard
Theeignards

New Des Moines Cars Received

Delivery was recently made of ten new cars purchased by the Des Moines Railway, Des Moines, Iowa. They are of doubletruck, single-end design, arranged for one man operation. Individual leather upholstered seats are provided, arranged in pairs. Special attention has been given to interior decoration and lighting. Artificial illumination is provided by two rows of shaded lamps, directly over the seats. After arrival the cars were placed on public exhibition on a downtown street, where they aroused much comment as to their appearance and interior finish.

Ohio Brass Company, Mansfield, Ohio, announces the opening of its new office at 505 Insurance Building, Dallas, Tex. This office will be the headquarters of T. B. Jones, district sales manager for the company in the Dallas territory.

ELECTRIC RAILWAY MATERIAL PRICES—AUGUST, 1929

Copper, electrolytic, delivered, cents per lb. Lead, cents per lb. 6.75	Metals—New York	
Smokeless Mine Run, f.o.b. vessel, Hampton Roads, gross tons \$4.17	Lead, cents per lb., ingot. Zinc, cents per lb., ingot. Zinc, cents per lb Tin, Straits, cente per lb. Aluminum, 98 to 99 per cent, cents per lb. Babbitt metal, warebouse, cents per lb.: Commercial grade.	6.75 35. 7.15 46.50 24.30
Standard steel rails, gross ton. 34, 17	Bituminous Coal	
Standard eteel rails, gross ton	Somerest mine run, f.o.b. mines, net ton Pittsburgh mine run, Pittsburgh, net ton Franklin, III., screenings, Chicago	1.87 1.80 1.50 1.10
cents per lb	Track Materials-Pittsburgh	
Wire nails, base per keg. \$2.55 Sheet iron (24 gage), cents per lb. 2.85 Sheet iron, galvanized (24 gage), cents per lb. 3.55 Galvanized barbed wire, cents per lb. 3.25 Galvanized wire, ordinary, cente per lb. 3.15 Waste—New York Waste, wool, cents per lb. 13. Waste, cotton (100 lb. bale), cents per lb.	nailroad spikes, drive, * in. and larger, cents per lb. Tie plates (flat type), cents per lb. Angle bars, cents per lb. Rail bolts and nuts, cents per lb. Steel bars, cents per lb.	2.80 2.15 2.75 3.90 1.95
Wire nails, base per keg. \$2.55 Sheet iron (24 gage), cents per lb. 2.85 Sheet iron, galvanized (24 gage), cents per lb. 3.55 Galvanized barbed wire, cents per lb. 3.25 Galvanized wire, ordinary, cente per lb. 3.15 Waste—New York Waste, wool, cents per lb. 13. Waste, cotton (100 lb. bale), cents per lb.	Hardware—Pittsburgh	
Waste, wool, cents per lb	Wire nails, base per keg Sheet iron (24 gage), cents per lb Sheet iron, galvanized (24 gage), cents per lb. Galvanized barbed wire, cents per lb.	2.85 3.55 3.25
Waste, Cotton (100 lb, bale), cents ner lb	Waste-New York	
Colored 12.5	White	12,5

Paints,	Putty	and	Glass-1	New	York
inseed oil (5 bite lead in	bbl. lot	a), cer 00 lb.	nte per lb keg), cents	per l	. 13.3 b. 13.3

Linesed oil (5 bbl. lots), cents per lb	13.3 13.2 \$0.57 5.725	
Wire-New York		
Copper wire, cents per lb	19.875 6.15 20.875	
Paving Materials		
Paving stone, granite, 5 in., f.o.b. New York—Grade 1, per thousand	\$150	

New York—Grade 1, per thousand Wood block paving 3; 16 lb. treatment.	\$150
N. Y., per sq.yd., f.o.b,	2.78
carload lots, f.o.b. Paving brick 3x8;x4, N. Y., per 1,000 in	51.00
carload lots, f.o.b	45.00
per cn.yd., delivered Cement, Chicago, in carload lots, without	3.25
bags, f.o.b	2.05
Gravel, 1-in., cu.yd., delivered New York	3.25
Sand, cu.yd., delivered New York	2.00

L Company of the Comp	
Old Metals-New York and C	Chicago
Heavy copper, cents per lb. Light copper, cents per lb. Heavy yellow brass, cents per lb. Zinc, old ecrap, cents per lb. Lead, cents per lb. (heavy). Steel car axles, Chicago, net ton. Cast iron car wheels, Chicago, gross ton. Raile (short), Chicago, gross ton. Raile (relaying), Chicago, gross ton (65 lb. and heavier). Machine turnings, Chicago, gross ton.	. 12.00 . 8.50 . 3.15 . 5.00 . \$16.75 . 14.25 . 18.50

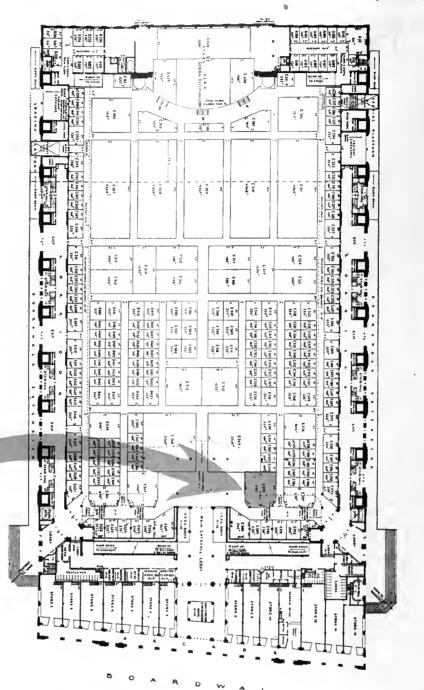
For your motorman's peace of mind and yours PEACOCK STAFFLESS BRAKES

When a motorman has to compromise the factor of security because of questionable brakes, how can you expect 100% schedule meeting and an accident-free record?



National Brake Company

890 Ellicott Square, Buffalo, N. Y. Canada:—Lyman Tube & Supply Co., Ltd., Montreal General Sales Office: 50 Church Street, New York City



Electric Railway Journal

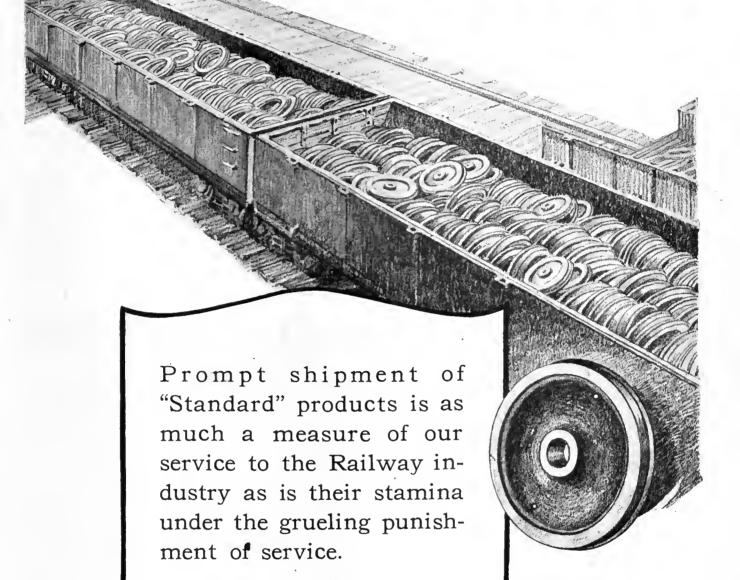
cordially invites you to make

BOOTH E575

your headquarters at the A.E.R.A. Convention, Atlantic City . . . September 28th to October 4th

At the main entrance

STANDARD



WHEELS

AXLES

SPRINGS

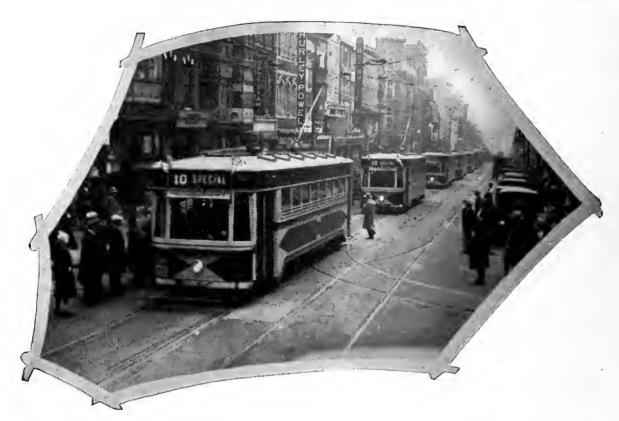
ARMATURE SHAFTS



STANDARD STEEL WORKS COMPANY

CHICAGO NEW YORK RICHMOND PHILADELPHIA, PA. WORKS: BURNHAM, PA.

ST. LOUIS PORTLAND SAN FRANCISCO



Giving Impetus to Transportation

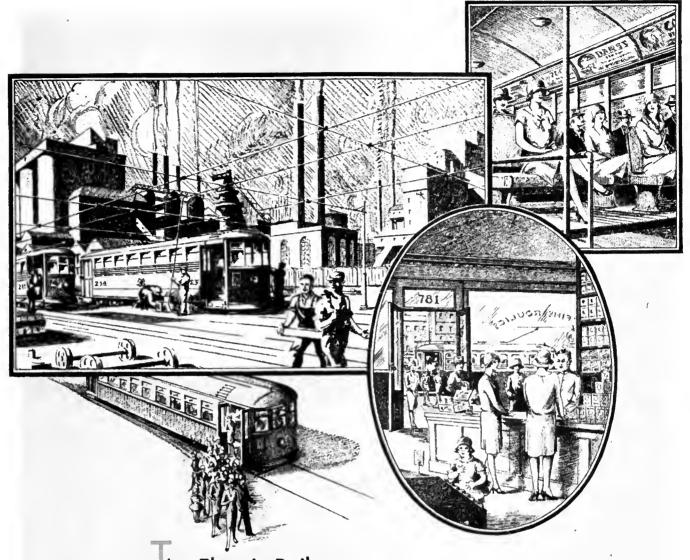
SPEEDY transportation is vital to present-day conditions. Car riders want it; car owners need it.

An important factor in the realization of this objective is the Safety Car Control Equipment. It brings economic advantages that warrant additional cars... assures the quickest possible brake action... provides maximum convenience and flexibility in controlling entrance and exit... safeguards operation by interlocking power, brakes, and doors and by centralizing responsibility.

Safety Cars are giving a noteworthy impetus to transportation service on hundreds of traction properties.







he Electric Railway is an outlet of the power, machinery, car building, and other industries. It works for all of them. But its greatest service is to the riding public. Likewise where advertising promotes many interests, its chief function is its service to the consuming public. To long survive, any business must convey its benefits to the ultimate consumer.

BARRON G. COLLIER INC.

NEW . YORK . CITY

General Guarantees You at Least

a guaranteed a guaranteed a guaranteed Savings that of either solids

HESE are excerpts from typical letters we have received. All testify to the unbelievable economies that General's Truck Balloon makes possible. What it has done for these operators it can do for you.

"This truck is running from warehouses to oil field locations in deep and bad sand. With the balloon we run with 70 lbs. air while with high pressure tires we used to have to deflate to that and less to get traction. This caused the tires to blow out prematurely. Tread wear is very slight and mileage much greater."

"We are entirely sold on the balloons you put on our van. After a fast 3,000 mile trip the tires showed no wear, no evidence of transmission of heat from the brake drum to the tire, which used to make our high pressure tires break down within a few thousand miles." "Our last high pressure tires gave us about 22,000 miles. You will be interested to know that the balloons you put on our job have just been taken off after 57.750 miles—and are now being used as spares."

"Our run is 350 miles on high crown asphalt. Fifty miles of it is hilly, with sharp turns all the way. Because the Truck Balloon eliminates the slippage we had with high pressures we are now able to maintain speeds of 30 to 45 miles per hour. In ten months of operation with the Truck Balloon we have had no heat trouble whatever and tread shows comparatively little wear."

The New GENERAL

20% SAVING

reduction of rubber costs reduction of maintenance costs increase in route coverage quickly pay for the replacement or high pressure pneumatics

ONSISTENTLY the pioneer in quality tire progress, General has again led the way with the new Truck Balloon.

Amazing results from actual use in every kind and type of service prove that the tougher the job is the greater the difference when you change to the Truck Balloon. It is the final solution of the toughest tire problems.

With the General Truck Balloon you get all the benefits of true low-pressure: greater cushioning of truck and load, easier steering, maximum traction and non-skid contact; you increase load capacity and at the same time can run at higher average speeds—thereby eliminating 90% of all high-pressure pneumatic tire troubles. You have none of the operating handicaps of solids. Both tire life and truck mileage are materially increased.

Everywhere that the change has been made the answer has been the same. Operators' eyes have been opened to the meaning of real tire savings.

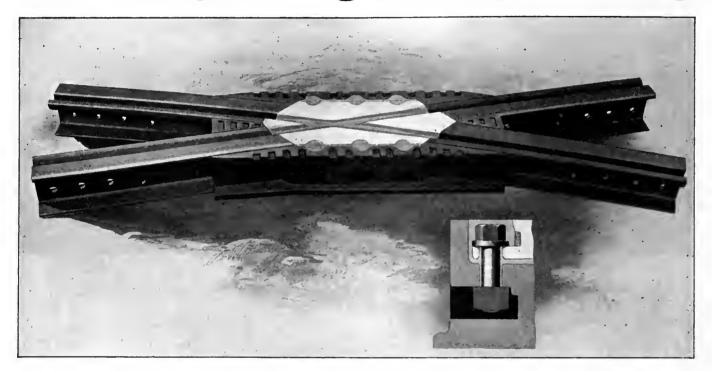
Based upon actual, proved results, we predict that within three years high pressure pneumatic equipment will be obsolete in 90% of all truck operation.

Call in your General Tire Dealer and get the facts on what General's Truck Balloon will do on your job. Built in Akron, Ohio, by the GENERAL TIRE & RUBBER COMPANY.

Be sure to specify the General Truck Bulloon on the next truck you buy Complete
Commercial
Line Includes:
Truck Ballottuck cord;
Express Special; Ballottuck
Express Special; Bellottuck
Cashio; Demountable
Special Cashion, Heavy
Cashio; Demountable
Special Cashion, bellottuck
Special Cashion, bell

Truck Balloon

TRACK SPECIALS



Iron Bound Hard Center Frog

This Lorain Frog is equipped with a bolted, Spelter-bearing, renewable Chrome-nickel Steel Plate.

The external Arms are rolled steel rails. They are firmly secured to the main structure which is semi-steel. Heat treated Chromium steel hold-down bolts are employed, having a minimum elastic limit of 100,000 pounds per square inch. The material which seals the bolts may be chipped away should it be necessary to renew the Plate.

Nuts are sealed against moisture with asphaltum.

Would you wish to have our quotations on this popular Lorain special of wide utility?

Write our nearest District Sales Office:

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The Lorain Steel Company
General Offices: 545 Central Avenue, Johnstown, Pa.

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Lilingis Jeel Loumfany

Minnesota Steel Company

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National Tube Company

National Tube Company

Universal Portland Cement Company

States Steel Products Company, New York City

Lowest Operating Cost ... Brighter Lights

with this
specially designed
MOTOR COACH
BATTERY

BIGGER profits result from lower maintenance costs. And here's one way to help reduce maintenance charges. Be sure that the batteries you use on your motor coaches give you lowest operating

cost per mile.

To accomplish this, hundreds of successful operators use the Exide Motor Coach Battery expressly planned for heavy motor coach service. This battery backs a generator

of the right capacity on their coaches. They have bright, well-placed interior lights that furnish reading comfort and attract fares. Their headlights are continuously strong for on-schedule trips. And operating cost is reduced to a minimum because of the scientific construction of the Exide Motor Coach Battery.

Such scientific construction is the result of fortyone years' experience building dependable batteries combined with a thorough knowledge of motor



coach battery needs. The Exide Motor Coach Battery has the stamina for long running hours, the power for peak lamp loads, and the ruggedness for day-in-and-day-out

service. A letter will bring you full information on this really remarkable battery.



Attractive service





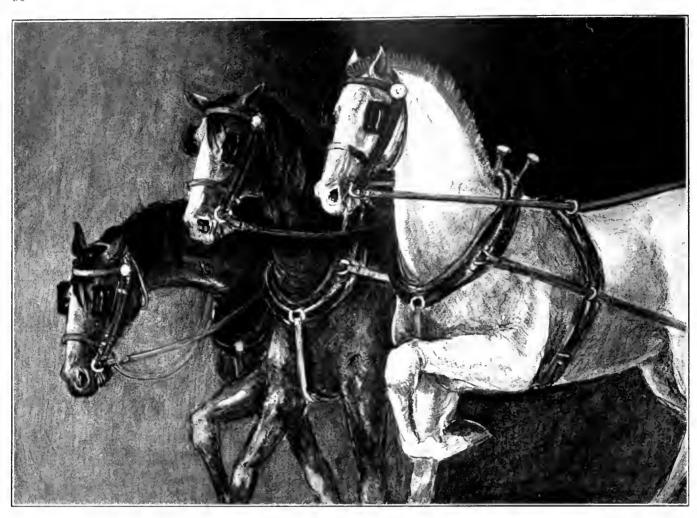
SOLD AND SERVICED BY

for your patrons at minimum cost

Coaches you give your patrons everything they want—the speed, quiet, safety, comfort and inviting appearance that only the finest of motor coaches can provide And the initial and operating costs are lower. Dodge Brothers 21-passenger street car type coach and 16-passenger Parlor Car fit the needs of operators everywhere.

BROTHERS COACHES

DODGE BROTHERS DEALERS EVERYWHERE







A new horse that can be hitched with the old ones

Mercury arc power rectifiers can be used in conjunction with rotary converters now installed.

If the converter has a shunt characteristic it may be closely connected in parallel with a rectifier.

If the converter has a flat compound characteristic or an over compound characteristic, it may be connected in parallel with a rectifier provided sufficient distance intervenes between the two units. Remember, a rectifier may be installed anywhere, without special foundations, and without regard to the nuisance problem that would attend the noise and vibration of rotating machinery. Remember, too, that a rectifier can be operated at a distance as safely and conveniently as if the operator were in the same room.

The new horse can be hitched with the old. It will work better and more efficiently, give less trouble, and will be ranked as up-to-date equipment long after the old ones are obsolete.

AMERICAN BROWN BOVERICO., INC. CAMDEN, N. J.

AMERICAN BROWN BOYERI



No. 190-P Recliner

See Them in Atlantic City!

In spaces 506 and 507 at the American Electric Railway Association Convention and Exhibit at Atlantic City September 28 to October 4, the latest Heywood-Wakefield railway seats will be on display. Since the last exhibition, we have developed several new, practical features about which you will want to know and which we will be pleased to show you. The three seats illustrated above, and many other patterns, will be exhibited at the Heywood-Wakefield space.

HEYWOOD-WAKEFIELD COMPANY

BOSTON, MASSACHUSETTS

516 West 34th St., New York City J.R. Hayward, Liberty Trust Bldg., Roanoke, Va. H. G. Cook, Hobatt Bldg., San Francisco, Calif.

311 Railway Exchange Bldg., Chicago, Ill. A. W. Arlin, Delta Bldg., Los Angeles, Calif. The G. F. Cotter Supply Co., Houston, Texas

THE RAILWAY AND POWER ENGINEERING CORPORATION 133 Eastern Avenue, Toronto; Montreal; Winnipeg, Canada

3/50 MILES DAILY

The Aronimink Transportation Company operates a fleet of 27 modern vehicles which travel 3750 miles daily in serving the suburbs of Philadelphia. They have standardized on KOOLMOTOR PRODUCTS because they give—

More efficient lubrication

More economical vehicle operation

Decreased expenditure for replacement parts

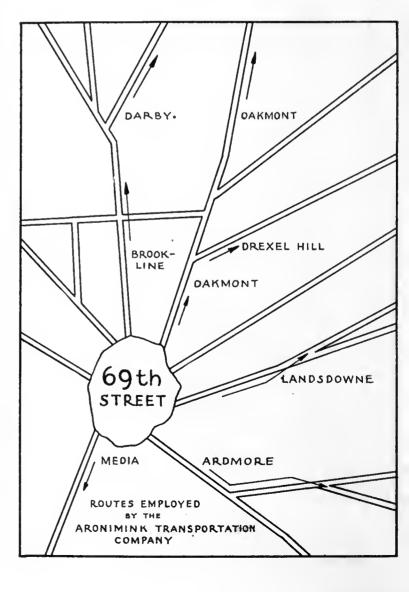
Koolmotor Products are refined entirely from the finest crudes of the Pennsylvania district without mixture with any other oils. They are tough, full-bodied, able to take the punishment of severe bus operation, and they stand up for miles after ordinary oil has broken down.

Our engineers will be glad to give you details of Koolmotor bus lubrication.

CITIES SERVICE COMPANY

60 Wall Street New York City

KOOLMOTOR PRODUCTS





A 100% user Tells Why you should install Ohmer Registers

Have you ever wondered just how OHMER Registers speed up service and increase profits?

Here are some of the ways ... given by a 100% user of OHMER Registers, Mr. W. D. Allen, of the Hamburg Railway Company, Buffalo, N. Y.

Read what Mr. Allen says about the ease of handling rush hour business.

"We find it (the Class 80 Register) adaptable on our short heavy city runs as well as on our suburban runs with variable rates of fare. Some of our routes are quite heavily traveled, averaging 50 to 60 passengers per trip during the morning and evening hours, and our operators are quite able to handle the loads with proper dispatch and keep on schedule time."

And here's what Mr. Allen writes about protecting fares.

"Receipts are issued to all passengers and are collected on their departure. This not only prevents over-riding but affords the company positive immediate means of field checking."

Quoting Mr. Allen on faster auditing:

"The master sheet has speeded up the auditing of our trip sheets and affords us at a glance the needed information for an 'on and off' check."

About maintenance Mr. Allen writes:

"Regarding the maintenance of these registers, we have found it very normal. In fact, the minor mechanical difficulties which we have encountered we feel arose from inexperienced or extremely careless operation."

The Hamburg Railway Company is 100% OHMER equipped.

"The receipt of our last order makes us 100% users of OHMER Registers on both our buses and street cars. We have tried various ways of registering and accounting our fares and are satisfied that your register fills our every want."

OHMER Registers will do the same for you

Increase the profits from every bus and street car you operate. Do it with the same type equipment that is cutting costs and increasing profits for the Hamburg Railway Company and thousands of other transportation companies the country over. Install OHMER Registers on every one of your cars and buses and bank extra money every month.

Find out all about OHMER Registers . . . about the models best suited to *your* business. Write today for catalog and any other information you would like to have.



The Class 80 Register

This is the type register which is installed on the buses of the Hamburg Railway Company in Buffalo. This type register "accomplishes everything that is necessary," according to Mr. Allen.

HMER REG.U.S. PAT. OFF. AND OTHER COUNTRIES FARE REGISTER COMPANY

DAYTON, OHIO, U.S. A.



Complete Car Replacement

Returns Investment
In Five Years With

CINCINATI CARS

At Lexington, Kentucky



simplicity

of the lightweight one-man interurban.

tractive

Quotations from an article, in the August, 1929, issue of Electric Railway Journal, by Mr. F. W. Bacon, Vice President of the International Utilities Company

NYESTMENT



On Both Interurban

N a property of this size, facing the rapid growth in automobile competition, it was obvious that the possibilities for the development of transportation business were limited. The maximum length of ride on the city lines is not more than 1 mile, and under these conditions the effect of direct automobile competition and, in addition, their tendency to pick up passengers waiting for street ears, is particularly severe."...

"Obviously, the question of greatest interest is whether or not the investment in new equipment was justified. We are quite convinced that it was. In fact, if we had attempted to continue operation of the interurban lines with the old equipment, this part of the property would have long since been abandoned."

"On the most conservative basis of comparison with the old ears, the investment in the interurban equipment was liquidated within three years. This has been accomplished despite an average annual reduction in gross revenue of approximately 5 per cent. On the city lines the new ear investment was liquidated within approximately a five-year period."

LIQUIDATED

Ind City Lines ---

RIOR to the installation of new cars it had been found impossible to increase the revenue; in fact, the property was steadily losing ground in the face of growing automobile competition. It should be noted particularly that there has been an increase of 30.1 per cent in passenger car-miles operated for the five-year period with new equipment, compared to the preceding five years with the old This brought an increase of 17.8 per cent in gross revenue, and an increase of 10.6 per cent in the number of revenue passengers carried. All of this is based upon a tenyear comparison—five years with old equipment and five years with the new cars. Operating expenses decreased only 1.3 per cent. The costs per car-mile, however, were reduced from an average of 20.9 cents for the old equipment, to 15.8 cents average over the five-year period with new cars, or a net reduction of 24.4 per cent. All operations in this comparison, both before and after the installation of new ears, were one-man. The net result of the investment in new cars has been (after deducting interest at the rate of 7½ per cent on the new cars) to increase the gross income 50.9 per eent over the five-year period, while at the same time permitting service to be increased 30.1 per cent. annual return on the investment in new cars was 22.6 per cent. It seems quite obvious, therefore, that the investment in new equipment was amply justified."

TRACK SAVING ALONE JUSTIFIES INVESTMENT



DDING together the amount creditable because of increased life of track through decreased wear and tear with light-weight equipment, and the direct reduction in maintenance cost, the total saving is approximately 10.7 per cent on the cost of the new cars. On the basis of a permanent property, therefore, the investment in new cars is justified by the figures for track economies alone. The facts of outstanding interest are not only the reduction in total cost, but in the track cost per ear-mile operated, which is about half the former figure. The ton-mile information is approximate only, but on the basis shown represents about a 10 per cent decrease despite considerably increased car mileage. The costs for maintenance per mile of track during the latter periods—with increased age of the structure—in comparison with earlier years, seems of particular interest and significance."

THE CINCINNATI CAR CORPORATION CINCINNATI, OHIO



Gasoline and Motor Oil must work in harmony

GASQLINE and motor oil perform entirely different functions in a motor coach, yet the efficiency of the one has a marked influence on the other.

The fluid friction caused by too heavy a motor oil increases the consumption of gasoline, sometimes as much as 8%. A gasoline that does not ignite readily and burn completely produces excessive motor oil dilution—sometimes to the point of decreasing lubricating quality 50%. If you would get the most mileage from gasoline, the most efficient lubrication from motor oil, select a fuel and lubricant that work in harmony.

Red Crown Gasoline and Polarine Motor Oil have been refined to work in harmony, to give that perfectly balanced performance which insures efficient service and low cost operation. Red Crown burns clean, gives power and mileage. Polarine is rich and sturdy, supplies thorough, efficient lubrication to the motor.

Try this combination in one of your motor coaches. The combined operating cost of Red Crown and Polarine will be better than that of other fuel and motor oil.

Our engineering bulletin "Motor Cooches and Their Lubrication," is a thorough treatise on the subject. Any motor coach company executive will find in this bulletin valuable information.

Would you like to look over one of these bulletins? We will be pleased to send a copy at your request.

STANDARD OIL COMPANY (Indiana)

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821

STRUCTURAL STEEL

Fabricated Steel Structures for every purpose



Progress Picture, Power Station

Fabricated Structural Steel by AMERICAN BRIDGE COMPANY

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Manufacturers of STEEL STRUCTURES of all classes, particularly

BRIDGES AND BUILDINGS

Roof Trusses, Columns, Girders, Towers and Poles, etc.

General Office 71 BROADWAY, NEW YORK, N. Y.

Contracting Offices in Principal Cities



The motor coaches of the Fort Dodge, Des Moines & Southern Transportation Company, Boone, Ia., are 100% Goodyear-equipped

3,600 Bus Miles Daily in Iowa

A large motor coach operation in Iowa raises problems more acute than those encountered in many states. First of all, Iowa is rural, with many miles of country roads between its cities. Every type of weather and road condition has to be met. There are snow banks to buck in winter—a constant possibility of mud in any season.

It is a test to show what the famous traction of the Goodyear All-Weather Tread adds to a tire, as well as a test of straightaway mileage.

Consequently, these facts take on special interest. "Our routes cover 475 miles of Central Iowa highways, principally graveled, with a meager percentage of paved roads. The regular scheduled bus mileage throughout the year will average 3,600 miles daily and will be somewhat augmented by special or charter bus operation.

"We have been extremely well impressed with not only the tire mileage obtained from Goodyear Tires, but also with the efficiency of Goodyear service during the past two years in which our thirty-three buses have been exclusively equipped with Goodyear Tires." These words were written by C. H. Crooks, President, Fort Dodge, Des Moines & Southern Transportation Company.

The highest individual distance traveled by a tire in this operation has been 70,601 miles. Another of these Goodyears has run 65,623 miles, and five more have each traveled more than 50,000 miles.

This certainly is an example of fitting the right tire to the hauling duty. Goodyear Truck and Bus Tire Service Station Dealers everywhere are equipped to render the same service to you.

For every Goodyear Cord Bus Tire there is an equally fine Goodyear Tube, built especially to the needs of bus service



Our best friends become our poorest customers.

A sad story—but true

THE railway lines that started to equip with "Tool Steel" gears and pinions 5, 10, or 15 years ago are now reaping the benefits in practically eliminating their gear purchases.

Our best friends are our poorest customers—figure it out for yourself.





DeVilbiss Stationary Canopy Type Car Exhaust (Patent applied for)

AINTENANCE factors in the electric railway field will find DeVilbiss has exactly met the highly specialized requirements of their finishing departments.

Every detail of DeVilbiss equipment for railway and bus finishing is designed for the particular task and the working conditions peculiar to the task. This fact is outstandingly revealed by DeVilbiss installations of exhausting equipment which assure speed, safety, economy, and perfect results.

It costs you nothing to learn how DeVilbiss equipment is serving the finishing needs of the modern electric railway operator.





DeVilbiss Tunnel Type Car Exhaust.

Spray guns of various types and sizes.

Pressure feed paint tanks and containers.

Air transformers and ac-

Spray booths, exhaust fans and approved lighting fixtures.

Air compressing equipment Air and fluid hose and connections

Complete outfits from the smallest hand-operated units to the largest industrial installations.

THE DEVILBISS COMPANY ,

PHILLIPS AVENUE , TOLEDO, OHIO

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Direct factory Representatives in all other territories

American Steel & Wire Company ARCON RAIL BONDS

"Trade Mark Registered"



A NEW principle of design is embodied in Arcon Rail. Bonds. This is the open terminal.

The open terminal has many distinct advantages. All terminals provide for easy arc manipulation. The end of the copper conductor is approximately one-eighth of an inch from the rail, and located in an open space which insures per-

fect welding of the copper wires. The sloping surface of the terminal after welding is a novel and important feature in arcweld bonds.

Be convinced by a practical demonstration which we will gladly give you at your convenience.

Prices and literature mailed upon request.

AMERICAN STEEL & WIRE COMPANY

Subsidiary of United States Steel Corporation

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WORGESTER 94 Grove St,

BALTIMORE......32 S. Charles St BUFFALO........679 Eilicutt St. WILKES-BARRE...Miners Bank Bldg. DALLAS......Praeturian Bldg. DENVER.....First Nat'l Bank Bldg. SALT LAKE CITY, Walker Bank Bldg.

Cutting the Cost of Trolley Pole Service!

THE actual cost of trolley pole service is not confined to the purchase price of the pole itself. What the pole can do from day to day to keep down delays, avoid traffic tie-ups and eliminate frequent repairs or replacement of poles—are factors that determine the ultimate cost of trolley pole service.

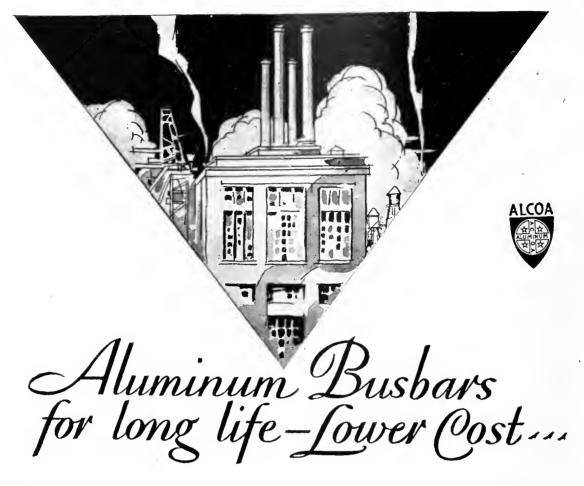
NATIONAL-SHELBY Poles are designed with sufficient strength to meet all service requirements and yet not be of excessive weight. A special form of reinforcement at the proper place gives the pole great strength while the grade of steel used and a special heat treatment after drawing gives a high elastic limit and assures long life and satisfactory service.

In addition, every NATIONAL-SHELBY Trolley Pole is individually tested before it leaves the mill—a form of test that approximates actual service conditions. This type of test is especially important in that it minimizes the possibility of any defective pole being installed—thereby helping to cut the cost of trolley pole service before it begins. A description of this test and complete information about these poles will be sent on request.

NATIONAL TUBE COMPANY, Pittsburgh, Pa. Subsidiary of United States Steel Corporation



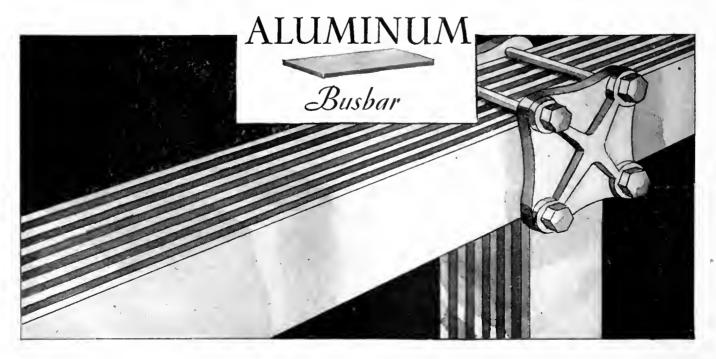




MORE than twenty years of hard steady service in this country has proven what Europe already knows. That Aluminum Busbars not only effect a real saving in cost, but perform their transmission functions steadily and reliably, day after day and year after year.

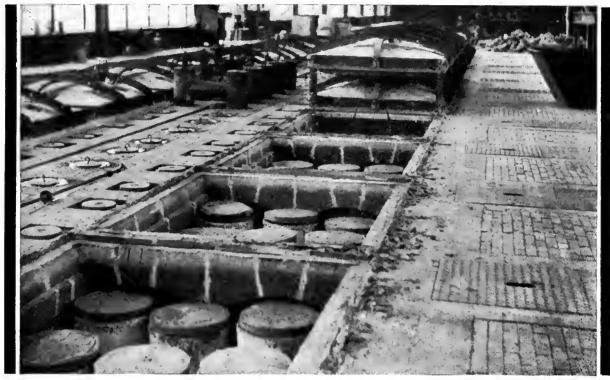
The booklet, "Aluminum Busbars," contains useful tables of weights, carrying capacities and physical properties. May we mail you a copy?

ALUMINUM COMPANY OF AMERICA 2463 Oliver Bldg., Pittsburgh, Pa. Offices in 19 Principal American Cities





20 days in a unique furnace



View of part of a ring furnace

THE "green" blocks as they come from the moulding machines are entirely unsuitable for use as brushes, though they have gone through eight major manufacturing operations, and innumerable minor ones, all under accurate scientific control. The next operation is baking. This is done in an unusual ring-type furnace, of exclusive design. The blocks, or in the case of small brushes, the pre-formed brushes themselves, are packed in the furnace, which is then fired by gas to a high temperature, carefully kept within close limits. The entire operation takes about 20 days. During it, the pitch binder is carbonized, the blocks and brushes made mechanically strong, and the material given the proper degree of electrical conductivity.

This unusual ring furnace is so arranged as to make continuous operation possible. All operations necessary to this process—loading, heating, firing, cooling, unloading—are conducted continually. In design, in efficiency, and in closeness of temperature control this furnace is most unusual, in fact, unique in brush manufacture.

We feel that our pride in it is fully justified by its results.

Time and money are saved by this furnace, which savings are passed along to you. In addition, better quality brushes are made possible, with that degree of uniformity for which National Pyramid Brushes are famous.

An interesting moving picture film illustrating in detail the processes used in the manufacture of carbon brushes will gladly be shown an request to any organization of engineers ar students





The Texas Company announces

With the acquisition of the Penniman patent rights and in combination with other rights, The Texas Company is in a position to offer to the Electric Railways of the country a new power-saving principle of lubrication.

Speaking conservatively, a 20 per cent saving in power is assured – 33 per cent has been attained.

Executives of Electric Railways are invited to correspond with us to secure complete data.

THE TEXAS COMPANY

Lubricating Division

Dept. L, 17 BATTERY PLACE, NEW YORK CITY

NOTE-these savings do not require any radical change in present methods





Order This Edition—Now! McGraw Electric Railway Directory

THE 1929 Edition of the industry's standard reference authority—an up-to-date, reliable guide to the active electric railway companies in the United States, as well as in Canada, Mexico and the West Indies.

Many changes in company management, personnel, and technical practices of the industry have taken place during the past year. The McGraw Electric Railway Directory will keep you abreast of these changes, and provide you with the data you continually need on this highly specialized field.

This volume is especially designed for railway operators and officials as an accurate guide to the industry, and as a personnel directory. For manufacturers in search of intimate knowledge of the field from a sales point of view, this new edition will prove an invaluable aid.

The Electric Railway Directory covers the entire Electric Railway Industry, including all electric railways, interurban and street railways, subway and elevated roads, electric railways with complementary bus service, subsidiary bus lines and the important electrified steam roads.

Listed in this comprehensive survey of the industry are all the active operating companies; the

holding companies; their managing and operating personnel; communities served; rolling stock; track mileage; shop locations; motor bus data—and other pertinent reference information which includes:—

Names and addresses of officials and principal department heads, including Purchasing Agents, Superintendents, Plant Engineers. Master Mechanics, Electrical and Mechanical Engineers Division and Resident Managers, Bus Managers, etc.

Names of principal communities reached by each company.

Names of subsidiary bus companies.

Names and addresses and officers of affiliated holding or controlling companies and of properties controlled by each.

Location of repair shops.

Location of power plants, and their total capacity.

Milea in paved streets.

Gage of track,

Number and kind of cars used.

Number and kind of cars used.

Number of buses operated.

Miles in bus routes.

Number of garages and capacity.

Rates of fare.

Transmission and trolley voltages.

Number and capacity of sub-stations.

Officers and Executive Committees of Electric Rallway Associations.

Commissioners and principal assistants of National and State Railway and Public Utility Commissions.

Alphabetical list of Electric Railway Officials, giving company connections.

The 1929 Directory is an invaluable source for information on the Electric Railway Industry that you constantly need. Order one or more copies now for your administrative, sales, engineering and credit departments. Also copies for your branch offices and representatives.

Bound in Full Imitation Leather-Handy Pocket Size

Price, \$10.00 per Copy

Limited Edition

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Name .																									
Compan	·																								,
Address																	٠.							,	
City															S	ta	te								

Why the man who changes the tires likes Goodyear type "K" rims



Opening Rim 1—Insert tool in notch near split. Push downward and toward center of rim.



Opening Rim 2—Insert tool in second notch and push handle downward toward center of rim.



Closing Rim 1—Match valve notches in rim parts. Grasp and spread as shown. Hook end of split section on ring.



Closing Rim 2—Press split section into place and finish closing with kick or light blow downward and outward from center

These eleven pictures show the remarkable ease with which the operation is performed



Applying Tire 1—Rest rim section on a 2-inch block as shown. Apply tire, valve pointing upward.



Applying Tire 2—Match up position of valve notches in each section of rim.



Applying Tire 3—Stand on ring section, near valve, to hook rim halves together.



Applying Tire 4-Continue walking around rim.



Applying Tire 5—Close rim by dropping on block or with gentle blow from a 2-to 4-pound hammer.



Tire on Rim-Ready for inflating and mounting on wheel.



Removing Tire — Deflate and proceed as shown by Figs. 1 and 2.

For complete information, and full co-operation of its staff of engineers, write Goodyear, Akron, Ohio, or Los Angeles, California



Type "K" Truck & Bus Rim Equipment

Smooth starting . . . rapid pickups . . . quiet operation . . . power savings . . . riding comfort . . . when car journals are equipped with . . .

ROLLER BEARINGS PRODUCT OF GENERAL MOTORS

The operating economies and better riding qualities made possible by the application of Hyatts are well known to many city and interurban car companies through actual service.

Hundreds of Hyatt equipped cars in various parts of the country today are evidence of Hyatt acceptance and faithful performance.

To those who may not be acquainted with Hyatt contributions to increased public good will and patronage, we welcome the opportunity of presenting facts and figures on anti-friction bearing journals.

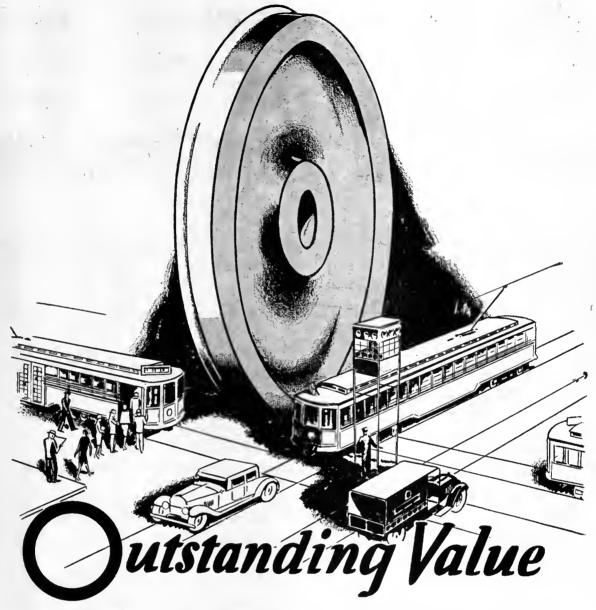
The changeover to existing equipment, or their adoption to new cars, is made easy through Hyatt conformance to A. E. R. A. standards.

From whatever angle you look at it, the Hyattway is the Saving Way... the Right Way.

HYATT ROLLER BEARING COMPANY
Newark Detroit Chicago Pittsburgh Oakland



Hyatt Roller Bearing Journal Boxes fit A. E. R. A. pedestals, size for size. Existing equipment can be modernized by their adoption just as easily as they are applied to new equipment.



Carnegie Wrought Steel Wheels for electric railway service are multiplelife wheels. Which means that when the ordinary wheel is worn out and ready for the scrap heap, the multiple-life wheel is still good for many years of service. The cost of reconditioning the contour is trifling compared with the cost of a new wheel. A special process of rolling and forging under enormous pressure insures a homogeneous structure, free from irregularities that might cause failure.

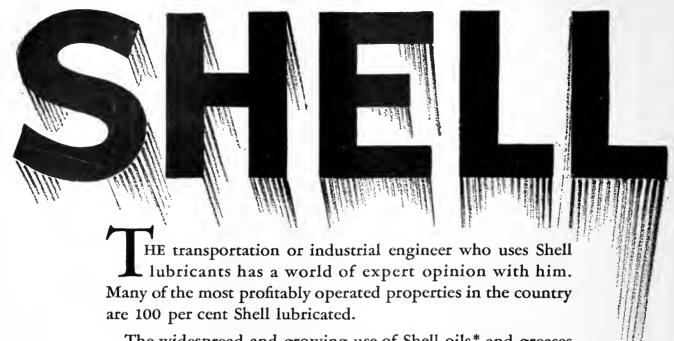
In city service, Carnegie Wheels have an additional advantage in that cars may be speeded up with safety over crossings, with less possibility of damage to special track work.

Operators who figure on a cost-per-mile basis will find Carnegie Wrought Steel Wheels the outstanding value in the wheel market today.

Booklet on request.

CARNEGIE STEEL COMPANY

Subsidiary of United States Steel Corporation CARNEGIE BUILDING PITTSBURGH, PA.



The widespread and growing use of Shell oils* and greases is due to the Shell policy of exactly suiting the lubricant to a specific need. Shell engineers do not have to recommend stock oils—which, at best, only approximate particular requirements.

Talking over your lubrication needs with a Shell technician when he calls, places you under no obligation . . . and more than likely will result in measurable operating and maintenance economies for you.

SHELL PETROLEUM CORPORATION
SHELL BUILDING * * * ST. LOUIS





Where severe operating conditions prevail....there you find





80% of the Coach in Pittsburgh

HE real story of successful De Luxe motor coach operation in Pittsburgh began in December, 1926, when the Pittsburgh Motor Coach Company placed its first trial order for 6 Yellow Coaches.

Operating conditions in Pittsburgh are exceptionally severe. Traffic is heavy. The grades are steep and long and winding. Here, then, are grueling conditions to test the stamina of any equipment.

Today 80% of the coach equipment used in Pittsburgh is Yellow Coaches. As in the case of so many companies who are using Yellow Coaches, the Yellow fleet of 52 coaches has been built through a steady series of repeat orders—each order based on the satis-



Equipment Used is Yellow Coaches

factory performance of the coaches preceding it. There has been no guess work in Pittsburgh.

Since the first order for Yellow equipment was placed in December, 1926, eleven successive repeat orders have been given for Yellow Coaches—52 Yellows in all, 10 of which have just been delivered.

The range of the Yellow Coach line has made possible a selection of vehicle capacities best suited to meet the different and difficult operating conditions in Pittsburgh. Thus Type "Y" 29-passenger Parlor Coaches are being used on heavy, well-developed routes, while Type "W" equipment is being successfully used to pioneer and popularize new routes where increased business is desired at minimum expense. Type "W" equipment is also successfully proving its ability to maintain summer riding on one of the older routes without any loss over the

normally heavier-riding winter months—the number of passengers carried on this route in June of this year being exactly the same as for January.

Since November (1928) the New Type "W's" have operated approximately 225,000 to July 1st, without a single pull-in from any cause. The first three coaches operated 30,000 miles each before even the carbon was removed —50,000 miles each with practically no overhauling—35,000 to 40,000 miles each before the brakes were relined—in Pittsburgh! Twelve of this type are now in service.

Such experience explains why the Pittsburgh Motor Coach Company is receptive to new advancements made in the Yellow Coach line. Both Type "Y" and Type "W's" are playing a definite part in a well-organized and well-balanced transportation system—and playing it well—typical of Yellow performance everywhere.



The Type "W" is proving an i deal vehicle for developing new routes where increased business is desired at a minimum expense. The first Type "W" was ordered for trial last November. . . . Two more were delivered in January. . . . Six in April. . . . Three in July.

The growth of the Yellow Coach fleet in Pittsburgh has been consistent; the performance of the coaches winning constant re-orders.



MORE Mileage MORE Passengers

Pittsburgh is Forging Ahead with

YELLOWS

Yellow Coaches will pile up approximately 2,340,000 miles this year for the Pittsburgh Motor Coach Company—almost double the mileage of 1928.

Since 1926 Yellow Coaches have been successfully meeting the difficult conditions imposed by a de luxe service which had been established to win the patronage of a public accustomed to private auto-

mobile transportation; the demand for a fast express service with comfort, safety and reliability of schedule. And in addition to meeting the demands for

a superior transportation service, they have also been meeting the severe operating conditions peculiar to Pittsburgh; long, steep winding grades and heavy traffic.

The fact that 80% of the motor equipment operated by the Pittsburgh Motor Coach Company is Yellow equipment indicates clearly the successful part that Yellow Coaches play in winning riders for America's largest exclusive de luxe bus operation.

General Motors Truck Co.

Pontiac, Michigan

As Harmonious as its Name

As a bus skims over the highway or ambles through traffic, its warning signal must appeal for the right of way in tones that are positive but pleasing. It must be heard—it must not be harsh

The PNEUPHONIC HORN gives warning of approach, unmistakable, yet not irritating nor startling. Its tone is loud, clear, distinctive, and harmonious.

WESTINGHOUSE AIR BRAKE CO. Automotive Brake Division—Pittsburgh, Pa.

The Westinghouse Pneuphonic Horn is available in various types and sizes to produce different tonal qualities, and in combinations for producing a pleasing chime effect when desired. Write for descriptive literature and prices. Mileage tells

the whole story!

Bethlehem Wrought Steel Wheels have the stamina to stand up under the hard pounding to which they are subjected by modern traffic conditions. Heavy, doubleend electric cars have proved them under thousands of miles of severe service.

Five distinct forging and rolling operations give Bethlehem Wheels multiple wearing qualities. The forging gives the steel toughness, while the rolling improves the grain structure and tends to prevent erystallization in the flange and tread. This construction insures high resistance to heat and wear, and consequently increased mileage.

Bethlehem Wrought Steel Wheels, when recontoured, continue to give excellent service and mileage. Small flats caused by skidding and sudden stops will pound out of themselves, and the wheels resume their original shape, thus keeping cars in continuous service.

The only true basis for the selection of car wheels is mileage. If you purchase wheels on this basis, the exceptional mileage and long life of Bethlehem Wrought Steel Wheels make them well worth your consideration.

BETHLEHEM

WROUGHT STEEL
W H E E L S

BETHLEHEM STEEL COMPANY : General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, 25 Broadway, New York City Sole Exporter of our Commercial Products

This Standard Specification

is growing more popular

THROUGHOUT THE BUS INDUSTRY





Shop foremen know the value of rubber. These rubber coupling balls not only permit proper seating, but for resiliency and insulation they are years ahead of fabric.



Rubber seam bands do what metal-tometal contact can't do-keep the rain out and eliminate the rattle! Goodrich makes them, of course.

Seven Superior Specifications

Built Into Every Goodrich Silvertown Heavy Duty Balloon

- Heavily insulated stretch-matched cords.
- Additional adhesion—from greater insulation between outside plies.
- Heavy twin beads for better rim seating.
- Extra gum fillers between plies for longer tire life.
- Heat-resisting, interlocking cord breakers.
- Tread designed correctly for heavy duty service.
- The whole tire toughened by the famous Goodrich "water cure."



"Goodrich HEAVY DUTY

Silvertowns"

In DEVELOPING new uses of Goodrich Rubber for the Bus Industry, Goodrich is making a definite contribution to a rapidly expanding industry.

Thousands of busses are equipped with Goodrich bus tires. Millions of miles of uninterrupted service are rolling up on Goodrich Rubber every month.

For wherever and whenever luxurious busses are known for uninterrupted service . . . Goodrich Tires and Goodrich rubber for the bus industry are recognized as contributing factors!

"Silvertowns on the front, duals on the rear" on your new bus specifications is a simple way to initiate a new kind of speed in bus operation, of uninterrupted tire service and of riding comfort for bus patrons . . . and to prove greater efficiency and economy in operation to stockholders!

This standard specification is growing more popular every day.

The B. F. Goodrich Rubber Company, Established 18"0, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Company, Kitchener, Ontario.

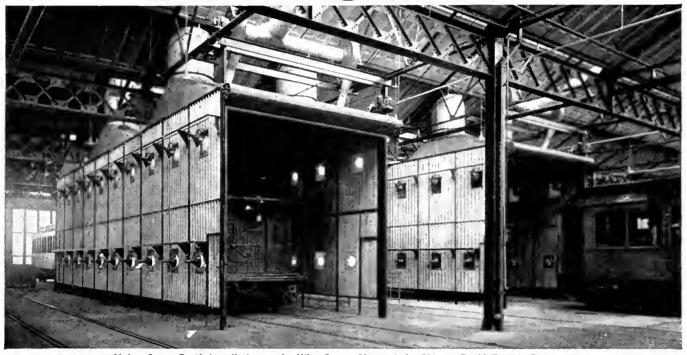


"Before we put Goodrich rubber fender flaps on our busses it was almost impossible for us to keep fenders straight,' sav the operators of over six hundred busses.

Goodrich

DUTY Silvertowns

Chicago Rapid Transit Cuts Painting Costs 75%



Mahon Spray Booth installation at the Niles Center Shaps of the Chicago Ropid Transit Compony.

THE installation of Spray Painting equipment in the Niles Center Shops of the Chicago Rapid Transit Company has resulted in this remarkable economy. Spray Booths, specially designed by Mahon engineers for this particular installation, are largely responsible for the rapid production and ideal working conditions which promote maximum efficiency. Mahon engineers, pioneers in the scientific development of Spray Booths for every purpose, are today backed

by a widely diversified experience covering hundreds of installations under every conceivable condition. To street railways and large bus operating companies we offer the services of this highly specialized staff of Spray Booth experts. Their knowledge of spray painting production methods and shop layout is of inestimable value to you. Consultation with Mahon engineers will not place you under any obligation. Write today.

THE R. C. MAHON COMPANY

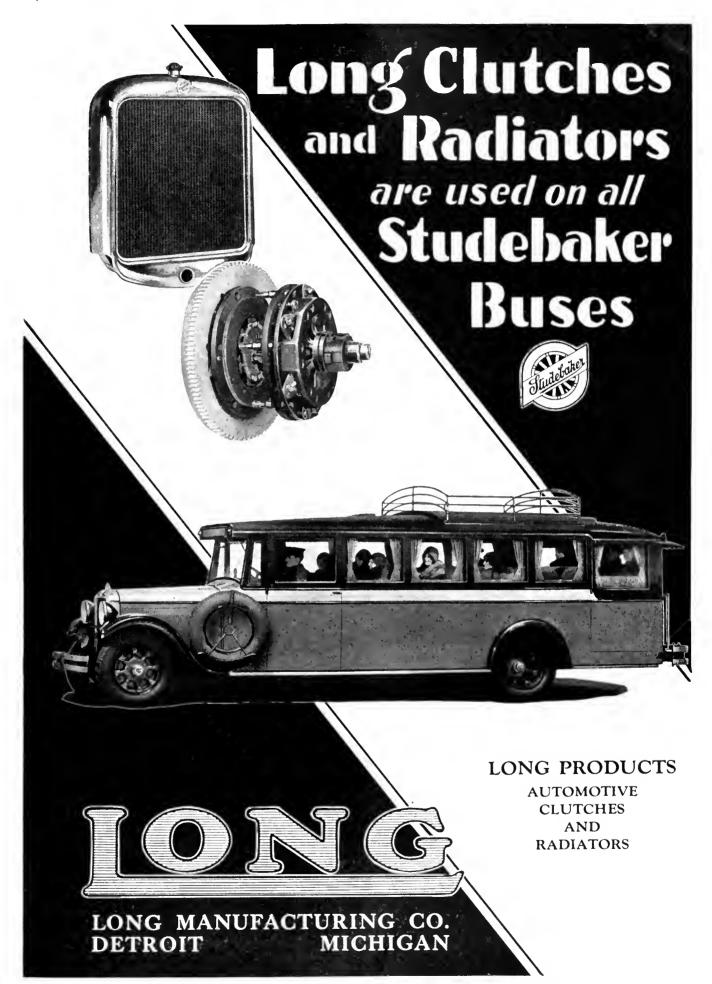
DETROIT, MICHIGAN

Manufacturers of Spray Booths and Exhaust Stacks, Industrial Drying Ovens and Blow Pipe Systems,

MAHON

SPRAY BOOTHS & EXHAUST STACKS

DESIGNED FOR FIRE SAFETY



In Wisconsin, too, their maintenance this improved

HE Northern States Power Company, operating throughout the western part of northern Wisconsin, has made extensive nection with a standard 85-pound and profitable use of Carey Elastite System of Track Insulation.

The photographs show how this advanced system was used at Eau Claire, in the Badger State, in con-A.S.C.E. T-Rail and a roadway of concrete . . .



Showing the application of Carey Elastite System of Track Insulation on the Northern States Power Company's lines through Eau Claire, Wisconsin.

THE PHILIP CAREY

they lowered cost by using traction development



The completed installation—Carey Elastite System of Track Insulation, used in connection with a standard 85-pound A.S.C.E.

T-Rail and a roadway of concrete.

Carey Elastite System of Track Insulation

is a resilient, durable, asphalt-and-fibre cushion. The asphalt has an extra-high melting point; yet, because it is blended according to a special Carey formula, it cannot become brittle even at sub-zero temperatures. It bonds firmly to the rail and to the pavement. It absorbs rail vibration and reduces excessive track noise. Invariably its use insures faster schedules, higher standards of service and lower maintenance cost.

If you are planning any development or track reconstruction work, it will be to your advantage to know Carey Elastite System of Track Insulation. Our representative will gladly call and supply you with the facts.



COMPANY, Lockland, CINCINNATI, OHIO



system is contingent upon dependability.

Time schedules must be maintained; passengers must reach their destinations promptly; safety and comfort must be assured; maintenance must be kept down.

At the hard service points of trucks, passenger cars. and buses, Timken Bearings have for 30 years proved their capacity to overcome speed, shock, torque, radial, thrust and combined loads-retarding wear, extending machine life, minimizing upkeep.

Thus, as unwavering dependability is demonstrated, the exclusive combination of Timken tapered construction, Timken POSITIVELY ALIGNED ROLLS and Timken steel permanently safe-guards the owner's investment.

THE TIMKEN ROLLER BEARING COMPANY A

Tapered BEARINGS Roller BEARINGS TIMKEN

There will be

on the Boardwalk in October!

T Atlantic City in October—when electric railway men gather in groups on the Boardwalk—there will be TALK.

... Groups listening to comments on the most modernized steel tie ever offered to the Electric Railway Industry.

. . . Groups expressing approval of the NEW precision type rolled steel rail clip that is sawed and drilled (not sheared and punched).

... Groups that will tell from experience of the advantages of complete machine methods for the treatment of concrete, and will lay verbal claim to the best track installations of the 1929 construction season.

There will be opportunities at the Convention Exhibit of the International Steel Tie Company to observe and check the value of perfect contact and bond between rail, ties and concrete that will win the approval of track men.

There will be those who will tell you of the low initial cost for laying their track with this type of construction.

Plan to hear this talk. See the modernized steel tie and installation methods. The developments in steel tie construction during the past year are astonishing.

DOINTS PARABETION Superior Fare Register

All Detroit Motor Bus Co. Buses are being equipped with Hyman Registers after careful test. Everywhere these Registers are shown, they are meeting with favor. Write for further information.



Hyman Transfer Cutter

Tear off sheet, and you have a transfer

By means of pointers which slide across the face of the sheet, time, direction, route and all needed information is recorded as sheet is torn off.

Simple — easy — eliminates transfer abuses.

- The passenger deposits his own fare in either the nickel, dime or quarter slot.
- 2 Automatic registration of the fare instantly.
- Increased efficiency.
- Inspection, of the coin deposited, by the operator.
- **5** Automatic release of coins from the inspection plate.
- Maximum speed in making change, removable in individual denominations of nickels, dimes and quarters.
- A maximum of schedule speed.
- Sold outright at extremely low price.
- Prevention of accidents because of the ease in the collection of fares.
- 10 One-man operation of buses or street
- ¶ ¶ Automatic operation continuously.
- Elimination of electrical operation, or complicated mechanisms, thus greatly reducing the possibilities of service failures necessitating fare collection by the operator without registration.
- Attraction to the Hyman Fare Register by the Public without any explanations by operator.
- No maintenance Cost to the Transportation Companies.
- The Hyman Fare Register is a small, compact, light-weight, rapid, accurate, simple and low-cost machine.

See our display at Atlantic City Booth No. E 585

Hyman Register Corp.

234 State St.
DETROIT, MICHIGAN

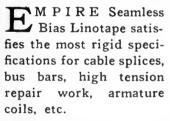
Greater

dielectric and mechanical

Strength!

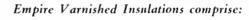
with added flexibility ... in these improved

Empire Varnished Tapes



We now offer Oil Packed Empire Seamless Bias Linotape with special characteristics for high tension cable insulation.

Recent tests have proven conclusively that this product is definitely superior. It has a uniform higher dielectric strength, a lower power factor and dielectric constant. Send for a sample can.



Seamless Bias Tape in long lengths Sewn Bias Tape Lengthwise Cut Tape Varnished cloth in 36" widths, straight or bias.

MICA INSULATOR COMPANY

EMPIRE

SEAMILESS BLAS

GIL PACKED LINOTAPE
THICKNESS

CONTENTS

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.

Works: Schenectady, N. Y. London, England
Cleveland Pittsburgh Cincinnati Birmingham Seattle
San Francisco Los Angeles Toronto Montreal



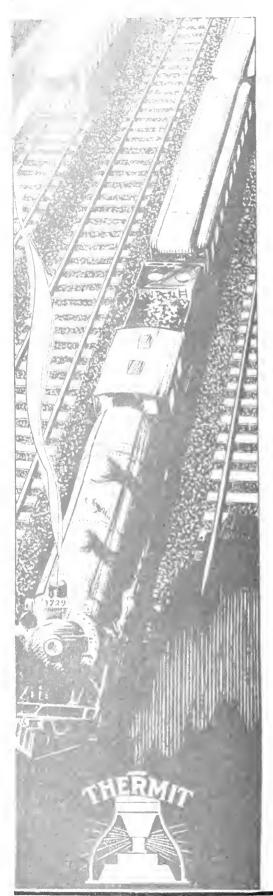
Electrical Insulation

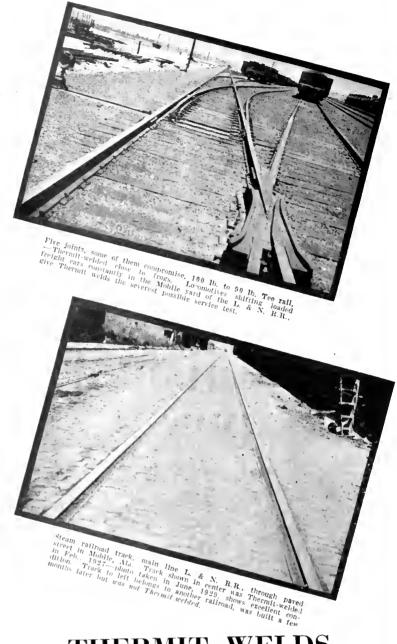


REG. U.S. PAT. OFF.

MICA INSULATION

OILED CLOTH INSULATION





THERMIT WELDS on Steam Railroad Tracks

No better proof could be found of the ability of Thermit welding to stand no netter proof could be found of the annity of Inermit welding to stand up under heavy traffic, than its growing use on steam railroad lines. Where railroad trains run through paved streets. Thermit welding has been found to be a satisfactory solution of the rail joint problem. A typical example—the Louisville & Nashville R.R. Co's line through Mobile, is shown above. Over this track passes the Crescent Limited, New York to New Orleans, and the nearly of track of fraight daily. thousands of tons of freight daily.

The world famous Twentieth Century Limited runs through the city of Syracuse, N. Y. over Thermit-welded joints.

Steam railroads also are finding Thermit solves their troubles with compromise joints in yards and terminals.

METAL & THERMIT
PITTSBURGH CHICAGO BOSTON 12.0 BROADWAY

PITTSBURGH



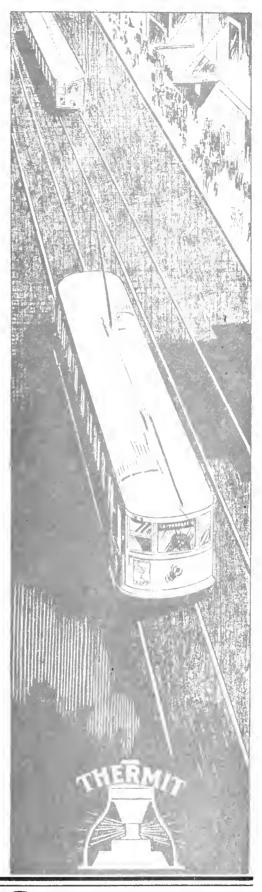


THERMIT WELDS on Electric Railway Tracks

Thermit welding of electric railway track is by no means confined to companies in the largest cities. Many systems operating fifty to one hundred miles of track, are using more and more Thermit, as the advantages of initial installations become apparent. The Mobile Light & Railroad Company is a typical example.

Other users of Thermit are to be found in every part of the United States and Canada.

The process of Thermit welding is so developed that it presents no mechanical or labor difficulties even to the smaller roads. Any reasonably intelligent trackman can be trained to make perfect Thermit Welds. The necessary apparatus can be purchased on easy terms, or rented at very moderate cost.



CORPORATION?

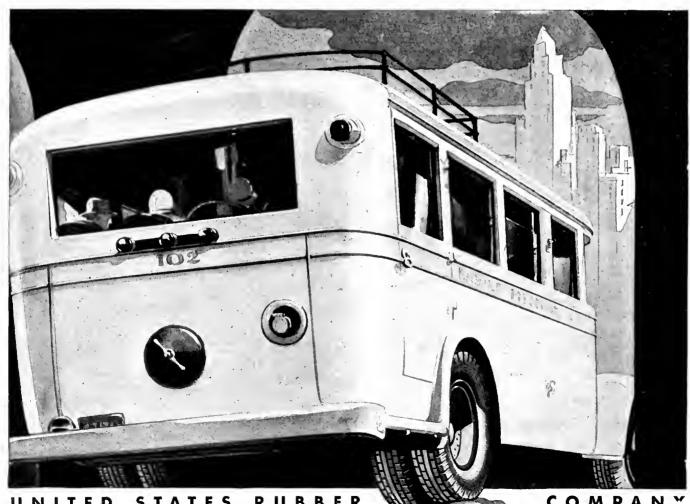
NEW YORK, N.Y. SOUTH SAN FRANCISCO TORONTO

DOLLAR FOR DOLLAR THE WORLD'S MOST ECONOMICAL TRUCK AND BUS TIRES

Some tires excel in one respect - some in another - but these new U. S. Heavy Service Tires have everything. They are built to dollarfor-dollar standards that defy comparison. Put them to a heavy grind in fast and continuous service under all sorts of traffic and operating conditions, and they will reveal startling mileage figures -unparalleled economies. More and more truck and bus fleet operators are standardizing on U.S. Heavy Service Tires for this very reason. Test them yourself. You can get a U.S. dealer on the phone—and he will cooperate with you to the limit



HEAVY U.S.ROYAL SERVICE. TIRES



THE WORLD'S LARGEST PRODUCER

COMPANY

OF RUBBER



29 Street-railway companies bettered their fare systems with Globe Transfers in past 24 months

Realizing the expense and complications involved if the Globe-designed transfers failed to accomplish their purpose, each of these companies made careful investigation before adoption.

It is gratifying to note that in each case these new transfers accomplish these results:

Greatly reduce round-tripping. Completely eliminate time-limit abuse.

Are faster and easier to issue.

Are positive in identification.

Such a changeover need not put you to great trouble. Give us the facts, and a chance to design a system for you, in cooperation with your representatives. Consult our nearest branch office for any fare-service you need.

In Booth E545 at the A. E. R. A. Convention you will see these 29 transfers and two new, efficient transfer holders, as well as the latest in tickets, receipts, hat checks, etc.

Globe TICKET COMPANY

Soles Offices:
Syracuse
Baltimore
Cincinnati
Cleveland
Pittsburgh
Springfield, Mass.

112North Twelfth Street PHILADELPHIA

Factories:
Philadelphia
Los Angeles
Boston
New York
Jacksonville

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller. It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility.

Squelching another whispering campaign—



"Look out for that company, it's slipping," said the whisperers. Its product, an assembled unit sold to manufacturers to build into their machines, was of high quality but had been sold only through salesmen and direct mail.

Sales were falling off. The market, conscious of the gossip, was suspicious of the financial strength of the seller. This increasing sales resistance was undermining the morale of the sales staff.

With this serious situation facing it, the company called in an advertising agent who recommended an emergency advertising campaign in a McGraw-Hill publication covering the particular market. The program, the first publication advertising ever used by this company, consisted of color spreads in every issue.

That was only a year ago. Today, as evidence of the company's comeback, sales are not only mounting but the advertiser's chief competitor has offered to sell out to the new advertiser. From bottom place to top position in recognition in one year.

MORAL: Selling is not a choice between salesmen, publication advertising and direct mail but a matter of co-ordinating all three and using each on a hasis of the job to be done.

M c G R A W - H I L L P U B L I C A T I O N S

New York Chicago Greenville Cleveland San Francisco Petroit Philad Boston ·

Philadelphia London

St. Louis

Canned Experience Make use of the other man's experience

That old saying
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most of us recite to may not
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Age fact. a ge worth man A single fact, a single table a single lees may be worth many single lees may the book to you. choose any
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Read them as you wish. for ten days free keep those you don't want. have for the those you have naw for the those you don't may naw for the those you don't may naw for the those you want. those you don't want, pay for the those you don't want, pay for the those you man they order to the done of the those or yided or more is books or yided or more is plan. It of yided or paymental plan, the property of the those of the property of the plan, the particular the particular the particular the particular the particular that in full within additional charge that is no additional charge.

Richey-

Electric Railway Handbook Second Edition, 798 pages, flexible, pocket size, 528 illustrations, \$4.00

528 illustrations, \$4.00

A thoroughly revised reference book of practical data, formulas and tables for the use of operators, engineers and students. It gives the essential reference data on all phases of electric railway construction and operation. It presents: (1) Data on subjects which come up in everyday electric railway practice. (2) Material of service to the mon-technical manager of operator. (3) Reference material on electric railway practice for those who are specializing in other or allied lines.

Harding—

Electric Railway Engineering
Third Edition, 489 pages, 6x0, 248 illustrations,
\$5.00

A thorough revision of this standard work on the theory and practice of electric railway engineering. The book covers the principles of train operation, power generation and distribution, equipment and types of systems.

Kurtz-

Lineman's Handbook

550 pages, porket slze, flexible, illustrated, \$1.90 550 pages, porket size, flexible, illustrated, \$1.50 The first bonk written expressly for linemen, foremen, and other employees of line departments. The book meets the grawing need for a pocket volume of construction and maintenance data, procedure, and methods. It presents hundreds of kinks, shortcuts, expedients and time- and worksaving methods, as well as scores of useful diagrams, tables, and formulas for the lineman.

Standard Handbook for Electrical Engineers

Fifth Edition, 2,100 pages, 4½x7, flexible, illustrated, \$6.09

A widely-known encyclopedia of electrical engineering. The book covers every branch of modern electrical engineering. It is complete and the arefulable, and so earefully and fully indexed that its information is readily accessible.

Croft-

American Electricians' Handbook

823 pages, pocket slzr, 900 illustrations, flexible, \$4.00

The book is a reliable, useful hand-book for wiremen, contractors, linemen, plant superintendents and construction engineers. It aims to give the practical man the facts on apparatus, materials and installation which he needs in his dully work. It is practical from cover to cover.

haid in full within six months.

Paid in full within six months.

There is no additional on the fort boats purch spices are the budget plan.

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South boats for cash. Choose the books you want to see — and just mail the coupon

Blake and Jackson-

Electric Railway Transportation Second Edition, 437 pages, 6x9, 121 illustrations, \$5.90

A second edition of this widely known book on the transportation side of the electric railway business — getting the cars over the tracks — increasing the traffic — collecting the fares — and selling service in the face of modern conditions. Particular consideration is given to the place of the bus in modern transportation.

King-Railway

Signaling 369 pages, 6x0, 349 illustrations, \$1,00

\$1.00

A completely adequate book on all phases of modern railway signaling. The book describes fully the construction, installation, oper ation and maintenance of signaling equipment, and presents a thorough discussion of principles.



Economics of Public Utilities

This book presents the essential facts and the most mature views upon the underlying financial and economic phases of public utility companies with particular emphasis on electric rallways, electric light and power companies and gas companies panics.

panics. It discusses every angle of the public utility as a business and treats thoroughly such subjects as capitalization, investment features, franchises, regulation, valuation, depreciation, taxes, rates, service, accounting methods, public relations, etc.

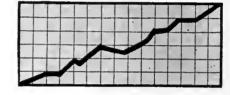
Mail this coupon to see these McGran-Hill books

Send me the books checked for 10	Cays' free examination:
Richey's Electric Railway Handbook, \$4.00.	Croft's American Electri- cians Handbook, \$4.00.
Harding's Electric Railway Engineering, \$5.00.	Blake and Jacksons' Eles- tric Railway Transporta- tion. \$5.00.
Kurtz' Lineman's Hand- book, \$4.00.	King's Raliway Signaling \$4.00.
Standard Handbook for Electrical Engineers, \$6.00.	Nash's Economies of Pub lie Utilities, \$4.00.
I agree to return such books as or to remit for them within 10 da	I do not wish to keep, postpaid, ays of receipt.
Name	
Home Address	
City	
Position	

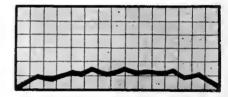


What is wrong with this star salesman?

With the BBK Crane Company he was a phenomenal success.



He went with the XYZ Crane Corporation and was a dismal failure.



The difference is not in the salesman nor in the product but in the nature of the Industrial Advertising backing him. Every industrial

salesman cannot be a star, but the best that is in him can be developed if the advertising policy and plan are based on achieving Recognition.

How to build this recognition in ten simple steps is graphically explained in the book, "Industrial Marketing at Work." A copy will be delivered by the nearest McGraw-Hill office to any executive responsible for sales or advertising to industry.

McGRAW-HILL PUBLICATIONS

New York Philadelphia Chicago Greenville Cleveland San Franciseo Detroit Boston St. Louis London

ALL types of City and Interurban cars of latest design and Modern construction are built by—

CUMMINGS CAR AND COACH CO.

Successors to McGuire-Cummings Mfg. Co.

111 W. Monroe St. Chicago, Ill.

Haskelite adds beauty to new Lynchburg cars

Beautiful finish, extraordinary strength and long life under severe conditions are assured for side and vestibule linings of 20 new cars for Lynchburg, Va., by the use of HASKELITE. These cars were built by the J. G. Brill Company for the Lynchburg Traction & Light Co.

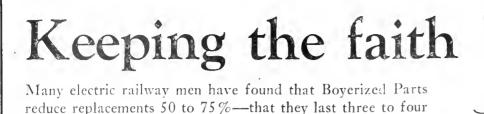
HASKELITE and its metal-faced companion, PLYMETL, are also ideal for structural panels on buses. Write for details of both applications.

Haskelite Manufacturing Corporation 120 South LaSalle Street, Chicago, Illinois

Railway Representatives:

Grayson Bros., 600 LaSalle Bldg., St. Louis, Mo.

Railway & Power Engineering Corp., Lt Montreal, Toronto, Winnipeg, New Glasg



Naturally these experiences have built up a tradition for long life around Boyerized Parts which must be true. It's our job to see

that each Boyerized Part lives up to this tradition, pays for itself many times over by cutting down excessive wear. Keeping the faith!

Look over the list and let us help you on your next replacement job.

LIST OF PRODUCTS

Brake Pins Brake Hangers Brake Levers Pedestal Gibs Brake Fulcrums Center Bearings Side Bearings Spring Post
Bushings
Brake Bushings
Bronze Bearings
Bolster and
Transom
Chafing

Plates

Spring Posts
McArthur
Turnbuckles
Manganese
Brake Heads
Manganese
Truck
Parts

BOYERIZED

PARTS

BEMIS CAR TRUCK COMPANY

ELECTRIC RAILWAY SUPPLIES SPRINGFIELD, MASS.

Representatives:

F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal. W. F. McKenney, 54 First Street, Portland, Ore. J. H. Denton, 1328 Broadway, New York City, N. Y. A. W. Arlin, 519 Delta Building, Los Aogeles, Cal.



JOHNSON FARE COLLECTING SYSTEMS

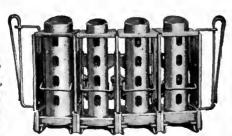


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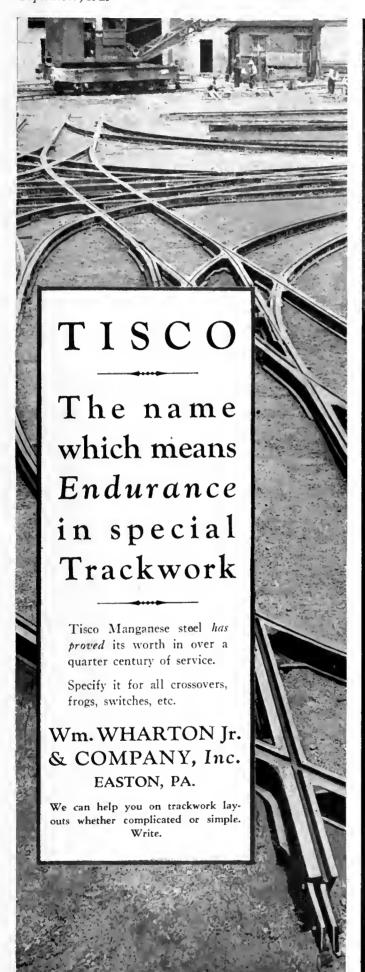
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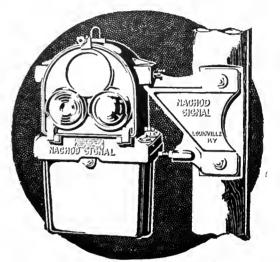


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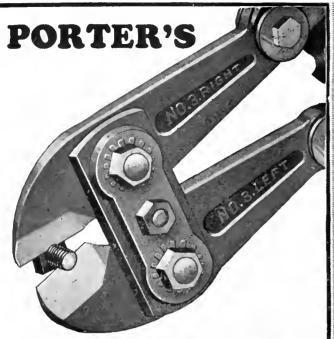
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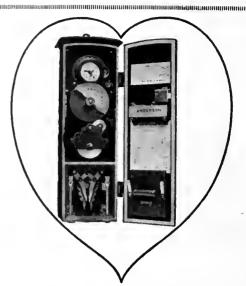
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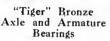
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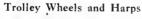
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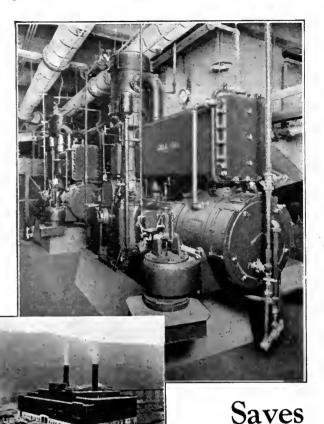
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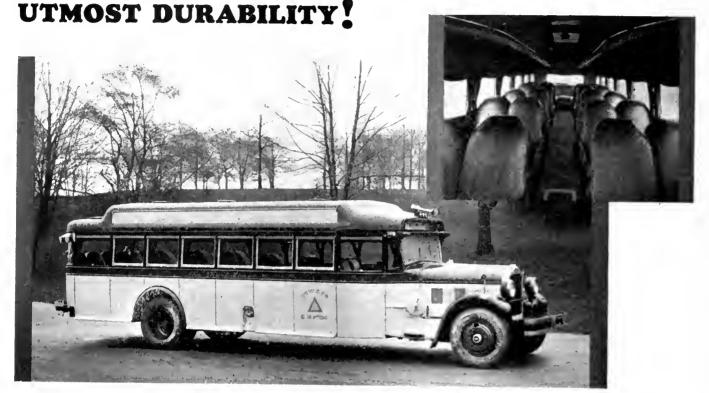
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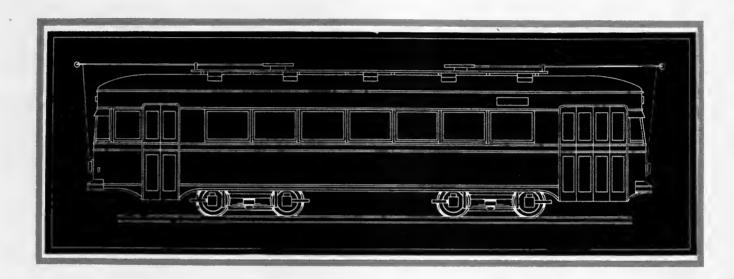
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The Lynchburg Traction & Light Company, Lynchburg, Va. have ordered twenty double-end Brill MASTER UNIT Cars for city service. When this new equipment is placed in operation. their entire service will be rendered with the latest Brill Cars, the MASTER UNIT type, which have won instant approval wherever they have been introduced. Operators and the riding public alike have enthusiastically endorsed their appearance and comfortable riding qualities. And no wonder, for this new development was brought about by the cooperation of Brill engineers with electric motor and car equipment manufacturers and railway operators.

All MASTER UNIT Cars have the same general characteristics of design such as curved sides below the belt rail, sloping two-part windshield type vestibule and well type steps.

The Lynchburg cars will be mounted on Brill 177-E Trucks and equipped with four 35 H.P. motors. Seating equipment will consist of deep-spring, leather upholstered Brill Seats of the 201-D type.

Experience teaches us that modernization is a sound investment, a means of increasing revenue and reducing maintenance costs. Lynchburg has faith in such a procedure.

Be sure to see the Lynchburg Car on Track "B" at the American Electric Railway Association Convention, Atlantic City.

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